DEC 16 1942

The Welding Engineer

NEER BUSINESS AND TECHNICAL JOURNAL OF THE WELDING INDUSTRY

ol. XXVII February, 1942 No. 2

WE DID IT IN 1917-
WE ARE DOING IT AGAIN *Today!*

The Alexander Milburn Company has been serving Government and Industry for over forty years. Milburn cutting, welding and spray finishing equipment saw "action" in World War 1 and is again today widely used in all phases of our defense activities . . . in aviation, shipbuilding, transportation, and industry. Equipment by Milburn may be relied upon for superior service under pressure of today's demands for "all out" Defense. Write for complete catalog.

The ALEXANDER
MILBURN
Company
1403 W. BALTIMORE STREET · BALTIMORE · MD.

Safer, Faster more Economical for surer Arc Welding — VICTORY

Model A-3 (right) — heavy duty, 500 Amps., outstanding for handling tough jobs requiring high heats. Equipped with new rod bender. Fully insulated, the deep slotted removable jaw plates of Mallory 3 Metal grip 1/16" to 3/8" rods at correct angle. Mechanical cable connection (soldered if you wish) is dependable.

Also available in Model A-2 (300 Amps.) and in Model A-1, same as A-2 but without replaceable jaws.

JACKSON INSULATED HOLDERS

NOW, less than ever, can we afford injuries to men or spoilage of work in this job of building armaments!

The fully insulated handles, tongs, springs and jaws of all Jackson Model A holders provide safety for the welder, avoid work spoilage due to accidental flashes otherwise common when bare holders contact grounded work. The insulation, plus scientific ventilation, provide *safety* and greater co*mfort* for the welder, increase his welding speed. Jackson holders are not only safe and faster in operation but they're more economical—*they last longer.*

QUALITY JACKSON PRODUCTS

JACKSON PRODUCTS

3265 WIGHT ST. **DETROIT, MICH.**

Contact your dealer, look over his line of Jackson Holders and we'll bet a hat you'll find just the holder you have always wanted.

Write today for the Jackson Holder Folder describing our complete line of fully and semi-insulated models ranging from 200 to 500 Amps. There's one for every arc welding need.

In Canada: Hollup Corporation Limited, Toronto - - Paragon Supplies Limited, Vancouver
Export Distributors: International Technic Inc., 381 Fourth Ave., New York City

1403 W. BALTIMORE · BALTIMORE · MD.

Vol. XXVII No. 2 February, 1942

The Welding Engineer

ABP ABC MEMBER

Associated Business Papers
Audit Bureau of Circulations
American Welding Society
International Acetylene Association

G. H. MACKENZIE
President and Treasurer

T. B. JEFFERSON
Editor

FRANK RICHTER
Promotion Manager

» «

Eastern Representative:
T. E. DEPEW, 1834 Broadway, New York, N.Y.
Tel. Columbus 5-7843

Midwest Representative:
D. R. WATSON, 506 S. Wabash Ave.
Chicago: Tel. Webster 7134

Pacific Coast Representative:
W. R. McINTYRE, 400 East Third St.
Los Angeles, Tel. Michigan 8918

» «

Published on the 1st of each month by The Welding Engineer Publishing Company, 506 South Wabash Ave., Chicago, Ill.

Telephone Webster 7134

Advertising copy must be received not later than the 20th of the preceding month.

IN THIS ISSUE

ARTICLES

Repairing Cylinder Heads 25

New Bottoms for Old Tanks 29
E. G. WOOLMAN

Magnetic Clamping 32
J. M. WHARTON

Aircraft Resistance Welding 33
L. P. WOOD

Maintaining Mining Machinery 38

Priorities for Welding 41
T. B. JEFFERSON

Advertisers in this issue 8
What's Here 13
Editorial 23
Silver Solder for Mine Cables 40
The Technical Slant 44
Brief Sketches of Welding Jobs 46
New Product Developments 48
News of the Industry 54
Engineering Data Sheet No. 17 57
Trade News 59
Personal 59
Current Reviews 61
Recent Patents 66
Classified 73

Subscription, payable in advance: United States and possessions, and Canada, $3 a year; Foreign Countries, $4 a year; Single copy, domestic, 35 cents; Single copy, foreign, 35 cents. Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

FOREIGN REPRESENTATIVES: AUSTRALIA and NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand; BRAZIL—Alpha Jewel, Caixa Postal No. 2411, Rio de Janeiro, Brazil; GREAT BRITAIN—A. D. Baynes, 1 Cambridge Park Court, Twickenham, Middlesex, England; SOUTH AFRICA—J. W. Arnison, 35a Victoria Avenue, Benoni Transvaal, South Africa; JAPAN—Maruzen Company, Ltd., 6, Nihonbashi, Tori-Nichome, Tokyo, Japan; U. S. S. R.—Mesdunarodnaia Kniga Kusnezki Most 18, Moscow, U. S. S. R.

DIALARC A. C. WELDER

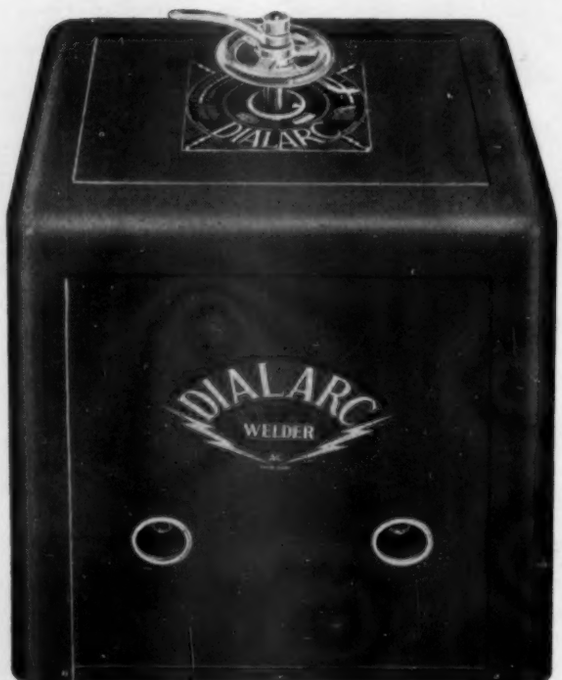
The first to give Perfect Amperage Control

EVEN TO A SPLIT AMPERE
From 15 to 230 AMPERES
Without Any Change
in the Open Circuit Voltage
Built for continuous operation and abuse hour after hour and at exceptionally
Low Current Cost

Every
DIALARC
is covered by a
5-YEAR SERVICE GUARANTEE
underwritten by an insurance policy

Tested and Approved by the UNDERWRITERS' LABORATORIES
A definite GUARANTEE of SAFETY and PERFORMANCE

Designed for
ARC QUALITY
that affords easy striking and the maintenance of a steady arc even in the Lowest Ampere Range.



The
DIALARC
DOES AWAY WITH "MAGNETIC BLOW"
So more rod is uniformly deposited per hour of welding time.

The
DIALARC Represents years of research and experimental work in its UNIQUE AND EXCLUSIVE FEATURES.

Our Variable Reactor
(patents pending)
gives the **DIALARC** perfect stepless control and a far greater range than any other welder on the market.

The open circuit voltage of the **DIALARC** is 80 volts, which gives excellent striking qualities from the lowest to the highest heats without any disadvantages.

This open circuit voltage is **constant** throughout the entire range, due to our specially designed **Variable Reactor**. With this we **do not** have to go down into the transformer and change our open circuit voltage in order to get the necessary amperage needed for good control.

The operating cost of the **DIALARC** is **much less** than that of a D. C. machine of the same capacity.

The **DIALARC** automatically uses current only while the arc is maintained. There is no heavy motor to keep running with a Dialarc.

Its unique construction is protected by a **non-magnetic housing** that prevents "damping-out" and assures a fast, snappy welding arc.

Inquiries invited from well established distributors of welders' equipment and supplies in states east of the Rockies.

SHOBER SALES INC.

536 SO. AURORA STREET MANUFACTURERS AND DISTRIBUTORS **STOCKTON, CALIFORNIA**

THE DIALARC—COSTS LESS AND ITS UPKEEP IS PRACTICALLY NIL

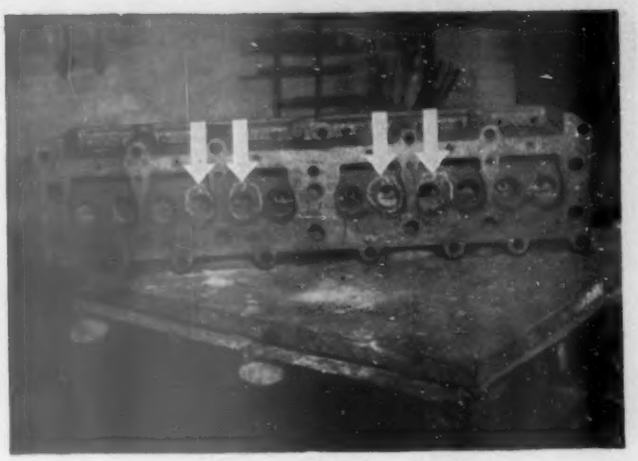


Fig. 1—The arrows indicate the four cracks in this cylinder head awaiting repairs.

Repairing Cylinder Heads

A job shop operator has taken a tough spare time job and turned it into a full time business. A true success story!

THE big problem of many job welding shops is that of keeping busy the year round. There are those busy periods when the capacity of the shop is taxed—work is turned away, then in a few days or weeks there is little or nothing to be done. The ideal situation, of course, is one in which there are no slack periods. This is the condition which exists in the shop of the Klugman Welding Co., Kansas City, Mo.

When Louis Klugman started in business in 1918, his shop often had its busy and slack seasons as did his competitors. Nevertheless, there were plenty of possible welding jobs which would keep the shops busy if they could be successfully done. One of these possibilities was the repair of cracked internal combustion engine cylinder heads.

Cracked cylinder heads have long been a source of trouble, annoyance and expense to the motorist. They likewise have been a source of annoyance and trouble to a good many weldors. It was because of this that Klugman felt they could be made a source of steady income for the weldor as well.

After considerable experimenting, he finally developed a "sure-fire" method for repairing heads in 1929, one that produced satisfactory results every time. The slack time in the Klugman shop was now to be occupied in welding cracked cylinder heads.

The Exchange Plan

Naturally, it was realized that it would be impossible to keep a customer waiting to have a head repaired every time the shop ran out of work, so the idea was to repair heads and exchange them for the customers' cracked cylinder head and some cash.

This feature was extremely popular with the motorist for it meant a saving in time and money. The usual practice, prior to the exchange plan, required that the motorist wait two or three days for the repairs. Besides having to wait he never knew what the job would cost. Costs were figured on the basis of "so much per crack" and many cracks were not visible until after the welding had been started.

Advantages Offered

The biggest advantage to the customer under this plan is the fact that he could obtain immediately, at a standard price, a head which, though repaired, appears to be and is guaranteed to be as good as new. There is quite a savings, too!

While the average price of a new head is $22.00, a welded head is priced from $6.00 to $8.00, depending on the type of head. If the customer does not have a head for exchange, he can obtain a reconditioned head at a dollar over the exchange price. The usual practice is for the car owner to obtain a reconditioned head leaving a dollar deposit which is refunded when his cracked head is turned in at the shop.

The advantages of this setup are not at all one sided. The shop besides being able to keep busy, experiences other benefits. By standardizing on a repair procedure, the shop owner is able to reduce his reconditioning cost to a minimum, yet at the same time he is able to guarantee the quality of every cylinder head that has gone through the shop. Since the reconditioning is undertaken on a semi-production basis, the shop is placed in a position to offer the customer a better price and consequently increase his sales volume.

In the Klugman shop, one weldor and two helpers recondition 25 heads in an 8 hr. day. These heads are reconditioned completely, that is, they are welded, tested, machined and painted. The heads are usually sent through in lots of six as it is obvious

Fig. 2—About 15 min. is all the time required to preheat a cylinder head in this specially built gas fired furnace.

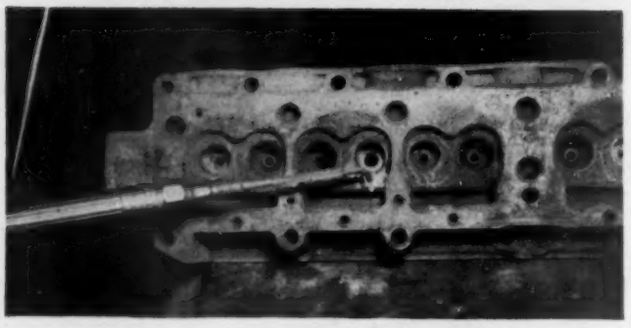


Fig. 3—A welding torch fitted with a large tip is used for cutting out the cracks in the valve ports.

Fig. 4—This is a closeup of the completed cutting operation. The arrow indicates the cut away section.

Fig. 5—The helper, aided by a long bar, positions the cylinder head during the welding operations.

Fig. 6—The next step is that of welding the crack on the inside of the valve port.

that quantity production method will reduce repair costs.

To be assured of having a stock of damaged heads for reconditioning, the shop takes heads from wrecking yards and garages, issuing credit memos which may be applied against the purchase cost of a repaired head. On an average, about 1000 heads a year are repaired and approximately 200 heads are kept in stock.

Repair Procedure

The placing of a repair job on a production line basis naturally required careful study but the Klugman shop has reduced the reconditioning procedure to six simple steps. They are: (1) preheating, (2) welding, (3) reheating and annealing, (4) testing, (5) machining, and (6) painting. The tasks to be accomplished in each step has been carefully worked out, so that there is little lost motion during the procedure.

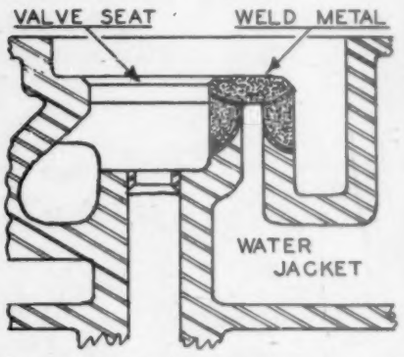


Fig. 7—This sectional drawing shows the schematic arrangement of the welds made in repairing a cracked cylinder head.

Production Line Methods

In the production line procedure involved in the reconditioning of cylinder heads, the job of the weldors' helper is particularly important. It is the helper's job to keep the head in such a position that the surface being welded is always horizontal. This is done with the aid of a long bar which is inserted in one of the bolt holes of the cylinder head so that the helper can readily move the head at the direction of the weldor. This is highly important since it enables the weldor to produce the soundest of welds in the least time. Another factor which helps speed the welding operation is the convenient manner in which welding flux is made available. On each corner of the welding table there is a container for flux. The container is located in such a manner as to always have flux handy, yet in no way does it interfere with the movement of the head for the various positions of welding.

The following is the procedure

used in reconditioning a cracked cylinder head of the straight-valve, valve-in-head type.

(1) Preheating: In Fig. 1 there is shown a cylinder head which has been brought to the shop for reconditioning. It will be noted that arrows point to the four cracks in the exhaust ports of this straight-valve cylinder head. Each of the cracks are about one in. long and extend into the valve port as is indicated. The first step is to preheat the head for about 15 minutes in a gas fired furnace. Under normal conditions, the head in this length of time is heated to about 1050 F or just under a red heat. It will be noted from Fig. 2 that the gas fired furnace has two sections so that one head can be preheated while another is being reheated following the welding operation.

(2) Welding: The first step in the welding operation is the cutting out of a crack in the top of the valve seat. This is accomplished in a rather unusual manner in that the cutting operation is carried on with a welding torch using about a No. 6 tip. The crack is heated to a cherry red heat, then more oxygen is turned on so that the metal is cut away right down to the water jacket. The width of the cut is about ¼ to $\frac{5}{16}$ in. In Fig. 4 the arrow indicates the section that has been cut away. Note the hole into the water jacket.

It is necessary to make sure that all of the oxide that has been formed on the sides along the vee during the cutting operation is removed before welding. This may be accomplished by adjusting the flame to a neutral condition and raising the base metal to the melting point. The oxide and dirt will then float to the surface and are dabbed out with a welding rod. Prior to this operation, however, the burned hole should be punched with a rod so as to knock into the water jacket as much as possible of the oxide scale that is present.

The cylinder head is now ready for the welding operation. The top of the valve seat is filled in first as is indicated in Fig. 5. One nice part about this operation is that the job is done with a $\frac{5}{16}$ in. cast iron rod so that you have no worries with priorities and brazing rod. The flame should be soft and neutral and plenty of flux should be used. This is extremely important. If a forced flame is used it will cause minute pin holes to form in the weld metal.

The vee is filled in starting at the bottom and working up. Care should be taken to see that there are no icicles or other obstructions formed on the inside of the water jacket. The

Fig. 8—The head is now positioned by the helper so as to make the back of the valve seat level. This section is then veed and welded.

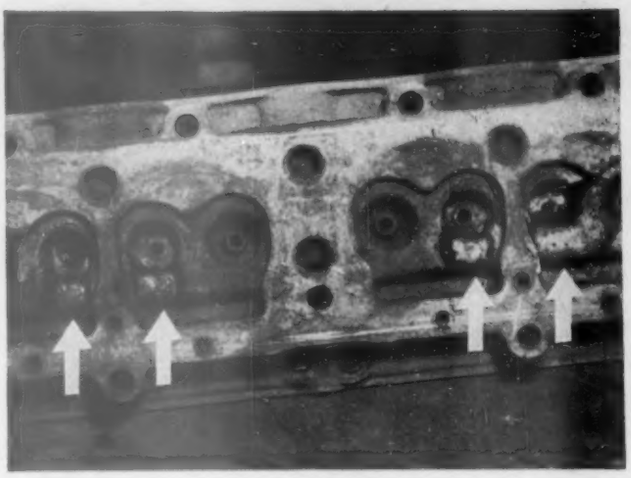


Fig. 9—The head shown in Fig. 1 has now been completely welded as is indicated by the arrows.

Fig. 10—The welded head is now ready to be placed in the furnace for reheating.

Fig. 11—Following the reheating operation the head is placed in an annealing bin, covered with sand and allowed to cool overnight.

Fig. 12—The testing operation is carried out using a 50-50 mixture of kerosene and penetrating oil. A dentist's mirror aids in detecting the leaks.

Fig. 13—Grinding the weld metal on the top and inside the valve port is a part of the finishing operation.

cylinder head is now positioned on its side, Fig. 6, by the helper so that the crack on the inside of the valve port may be welded. The positioning operation places this surface so that it is level. The weldor again uses the welding torch as a cutting torch and cuts out the crack almost to the bottom but not into the water jacket excepting at the valve seat. The cutting procedure is the same as previously described and the welding operation is also similar to that for the top side of the head.

The helper now positions the cylinder head so that the back of the seat is level and this section is veed and welded as previously described.

The final welding operation requires that the casting be returned to its original position and tie in the three welds on the top of the valve seat. Plenty of heat and a soft welding flame is used during this operation. The heat should soak in some as to remove pin holes and to float out any entrapped dirt.

While the procedure may seem long and complicated, the job is actually accomplished quite quickly. As a rule, about 5 minutes is all the time required for the welding of a single valve port. Weld metal is used sparingly and as a rule the welding is built up only about 0.010 in. above the original surface.

(3) Reheating and Annealing: Now that the head has been welded, it is again placed in the gas fired furnace and reheated to a cherry red. This takes about 15 minutes. In Fig. 10 there may be seen a cylinder head in the rear section of the furnace that is being reheated for welding.

After the reheating, the head is placed in an annealing bin. This large bin, which in reality is a large steel box, has a capacity for 25 cylinder heads. When a head is placed in a bin, it is covered with sand and allowed to cool overnight. After this 12 to 18 hour cooling period, it is then ready for testing.

(4) Testing: The various openings, water outlets and other ports in the cylinder heads are closed with gaskets and the head is tested by pouring in a 50-50 mixture of kerosene and penetrating oil into the water jacket. While this mixture remains in the jacket, the helper searches for leaks, he is aided in this work by a dentists' mirror which enables him to locate leaks around the corners. If no leaks are present, the head is now ready for the finishing operation.

(5) Machining: The finishing operations include: the grinding of the weld metal on the top and the inside of the valve port; reaming out of the valve port; and reaming the valve seat.

Following this operation the heads are placed on a specially designed surface grinder and a very thin cut is taken off of the face of the head so as to assure that the head will have a plain surface that will not leak when the head is installed on the cylinder block. This surface grinder is an unusual machine that has been developed by Mr. Klugman for this particular purpose and has been patented by him.

(6) Painting: The job is now complete. But so as to make the customer feel that he is getting a finished product, the entire head is painted, the bolt holes and spark plug holes are tapped; after which the head is placed to one side, waiting to be exchanged to a customer.

The reconditioning and finishing methods, which are in keeping with the entire repair procedure, make it impossible to tell a reconditioned head from a new one.

Thus, a job shop has taken on a side line. At first it was believed suitable only for filling in during slack times so as to keep the job shop busy but now the sideline has developed until it is a full time job. The result is that a profitable business has been established which is regularly and consistently bringing the public to the shop, an all important factor in the success of any job welding shop.

THE END

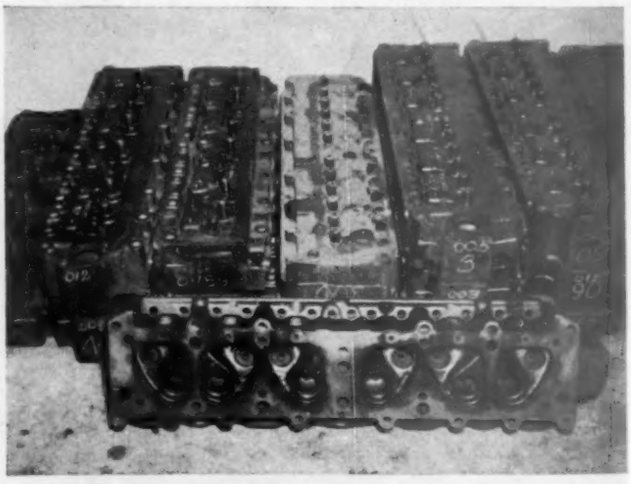


Fig. 14 — The reconditioned cylinder heads are now stored, each waiting to be exchanged for the cracked cylinder head of a customer.

Fig. 1—There are many storage tanks that need repair.

New Bottoms for Old Tanks

By **E. G. WOOLMAN,**
Welding Foreman, Cities Service Oil Co.
Ponca City, Okla.

Defense demands call for additional oil storage capacity. New bottoms in old tanks by the use of welding is the answer.

ADEQUATE storage facilities for petroleum products during the War is one of the many problems confronting the oil industry. There are plenty of storage tanks and working tanks located in various sections of the country but in many cases it will be necessary to undertake extensive repairs before they can be returned to service.

Tanks which were once used for the storage of gasoline, naptha, kerosene, gas oil and crude oil now stand idle and unused because of leaky and corroded bottoms. Corrosion has always been a problem in storage tank maintenance for it is generally severe around the bottom angles and the rivets in the angle which holds the side and the bottom of the tanks together. Oft times this corrosive action will extend up the tank side plates three or four inches.

To recondition these tanks so that they can again become useful is a requirement that has been made imperative by the war demands. Demands which make it necessary to place all tanks in active service! To do the job properly it is necessary to install new bottoms and, if necessary, new side plates.

The question is—how is this work to be done? When costs and time are considered, the answer is nearly always—by welding.

A new riveted bottom for a 52,000 gal. tank can be installed, labor and material, for $806.63 while the labor and material cost for fabricating and installing a welded bottom in a tank a similar size has proved to be $576.68, or a saving of $229.95. Naturally, at these cost figures new bottoms are of arc welded construction. Welding has proved to be a lot faster, too!

The job of installing a new bottom in an old tank is easily accomplished if certain fundamental practices are followed. First of all *safety must be given consideration.* It should be remembered that empty oil tanks, no matter how long they have been empty, are loaded with vapors that are highly explosive. To prevent injury to personnel or damage to property, the tank that is to be reconditioned must be cleaned properly.

Steaming, of course, was the first step necessary to remove all vapors and oil so that a possible fire or ex-

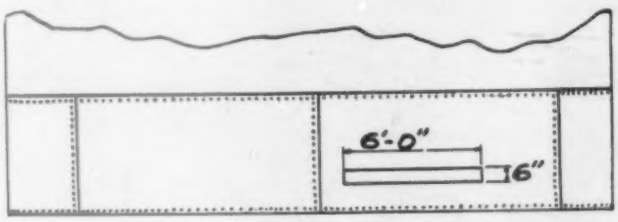


Fig. 2—A small slot serves the purpose of a door sheet.

plosion may be prevented. After steaming the old bottom is then cleaned further with fuller's earth.

Placing Plates

The next problem is that of getting the plates for the new tank bottom inside of the tank. This may be done by one of two methods, either by taking out a door sheet or by cutting a slot in the side of the tank near the bottom. The latter method is the preferred because the closing of the smaller opening involves less work. In Fig. 2 there is shown a sketch of such an ingress slot. It is 6 ft. by 6 in., the lower edge of the slot is about 5 in. off the floor of the tank.

Such an opening makes it a comparatively easy matter to slip the five or six foot width plates into the tank, that are to be used in the construction of the tank bottom.

Before the plates are taken into the tank, they should be notched and layed out as they will be in the tank. When in this position it is possible to determine the arc of the plate ends. The plate ends are cut to a radius that is 2½ in. less than the original inside radius of the tank.

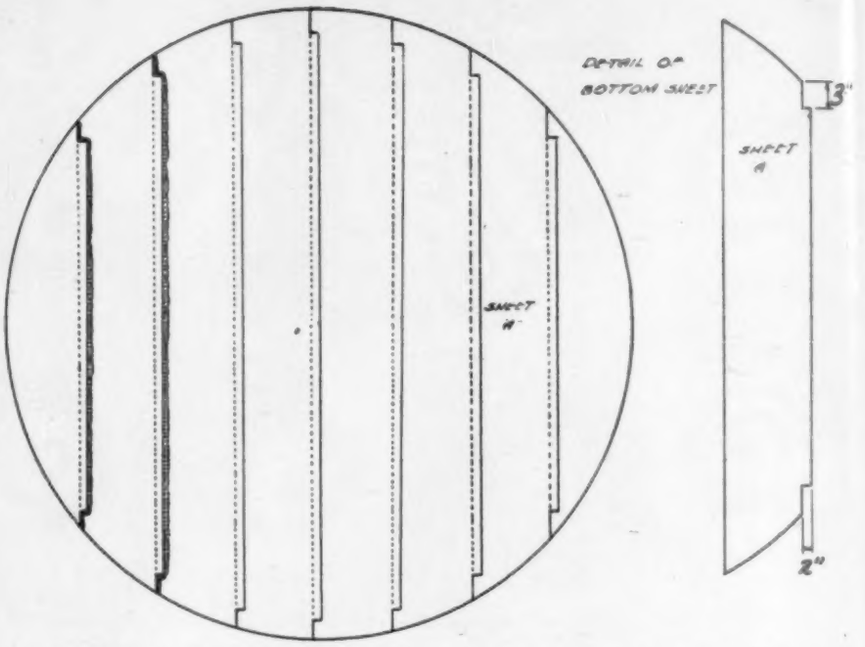


Fig. 3.—(Left) A sheet layout for a reconstructed tank bottom. Note the lapping of the sheets and the use of a notch to produce a smooth circumferential edge. (Right) The detail of a bottom sheet.

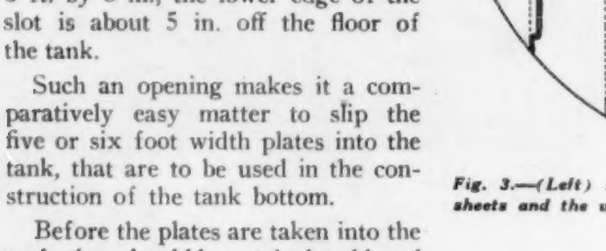


Fig. 4a — Inside view of tank rivet seam, showing notch to be cut out, to act as a liquid seal.

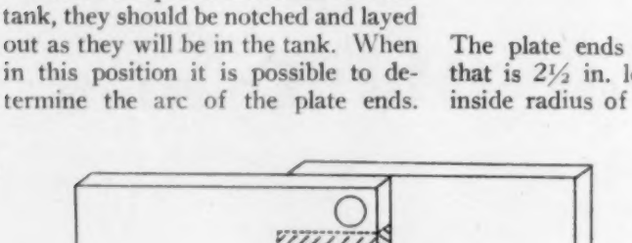


Fig. 4b — The notch after cutting.

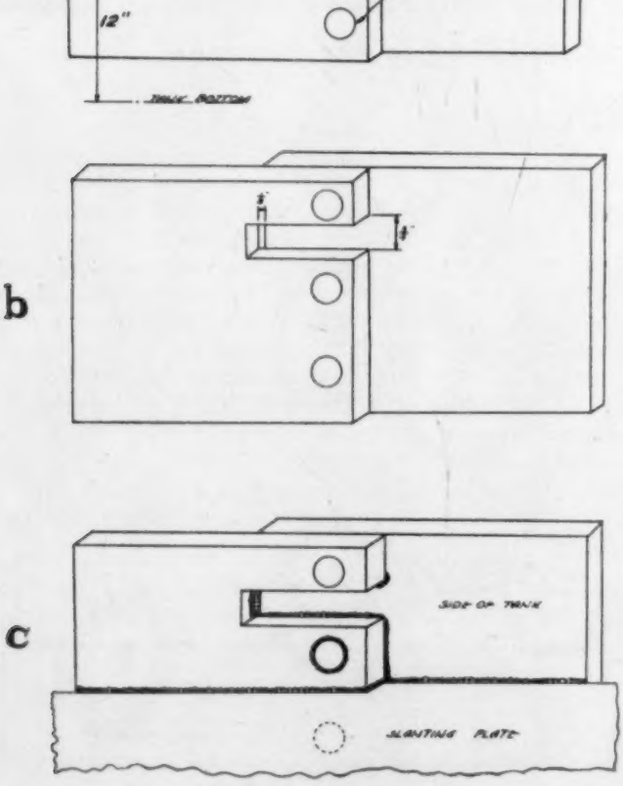


Fig. 4c — Finished construction showing welding of notch, rivet head and slanting plate.

Welding the Bottom

Fig. 3 is a drawing which shows the actual method of construction used in fabricating a new bottom for a tank with the use of arc welding. It will be noted that the plates are overlapped with the exception of about 3 in. at each end. At each end a notch has been cut in the plates so that the adjoining plates are butt welded to form a smooth, flat surface around the circumferential edge of the new bottom plates. On the remainder of the seam the plate is sealed with a fillet lap weld. Only one pass with a $\frac{3}{16}$ in. mild steel electrode is used in making these two types of welds.

It is on this notched feature that much of the savings and success of the arc welded tank bottom depends. Since the notch makes it possible to obtain a smooth edge, free from joints or laps, the major problem of welding the side plates to the bottom is instantly eliminated. The elimination of lap joint also reduces the welding requirements and simplifies the manner in which the side plates are joined to the reconstructed bottom.

To take care of any corroded condition that might exist, on the inside of the tank, a 12 in. slanting plate as shown in Fig. 5 is also welded to the new tank bottom. This plate is so slanted in the tank so as to permit the lower edge to rest on the newly

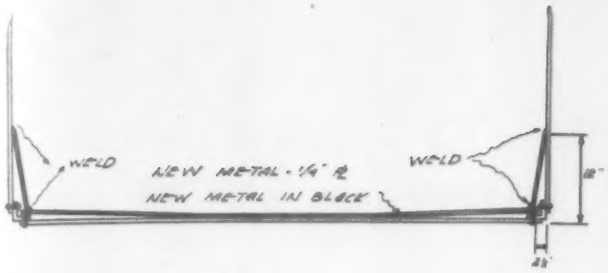


Fig. 5—A cross-section of the tank showing location of new and old bottoms.

fabricated bottom while the upper edge rests against the side of the tank. The adjacent edge of this slanting plate is welded to its support structure by means of two beads. The vertical seams of the slanting plate are single pass butt weld, similar in every respect to the tank bottom welds except for position.

In addition to reinforcing side plates that might be corroded, this slanting plate serves another purpose. This function is probably its most important, for it materially increases the service life of the new tank bottom. Since this side slopes slightly toward the center of the tank, it gives the bottom a certain degree of flexibility preventing the imposition of undue loads or strains on the reconditioned tank bottom.

When the upper edge of this slanting side plate was welded to the tank side plates it was found that a special welding procedure was necessary to avoid a leakage difficulty because of the expansion and contraction of rivets in the seams of each of the tanks vertical riveted joints. To overcome this, a notch ¾ in. high and 3 in. long is cut as shown in Fig. 4a. A welding bead was then run up the joint, around the notch and around the rivet heads. (Fig. 4c). This prevents any liquid from seeping behind the rivets or running down the seam in back of the slanting plate or underneath the new bottom.

After the new bottom has been installed and the welding is completed, that section which has been cut out of the tank side to form a door sheet is now welded back in place. There is no need to make this weld tight since it has been cut out below the top of the slanting plate on the side which has already been welded.

The old storage tank has now been reconditioned sufficiently that it is good for many years of satisfactory service. This method of reconditioning by arc welding—has been such as to prevent future corrosion. Also, there has been formed a new bottom which will not pull or break away from the sides since the slanting plate allows for free movement and breathing due to varying liquid pressure.

The illustrations in this article are credited as follows: Fig. 1, the Chicago Bridge & Iron Co.; Figs. 2 to 5 inc., Hobart Bros. Co. and the author.

THE END

The Weldors' Strike

(An Editorial)

(Concluded from page 23)

assurance that their rights of self organization will not be overridden thru political deals made in Washington."

The above editorial, which is reprinted from the Chicago Sunday Tribune of February 1, 1942, fairly accurately expresses the thoughts of both the public and the weldor.

Most of the crafts desire unions for unions do offer advantages. The same applies to the weldor. However, he does not enjoy a dozen unions but just one as the other crafts enjoy.

All of the present day weldor's difficulties center about a mediation board award . . . *not a Federal law* . . . made in 1918 which is known as the Wilson Award. In the Wilson Award the welding processes were likened to a hammer. In 1918 the use of welding processes was much more involved and complicated than wielding a hammer. In the 24 years that have passed since this labor board decision, the intricacies of welding have increased an inestimable amount.

Despite the complications of welding it is not sufficiently involved to be defined as a craft, according to the AFL. To the AFL, welding and weldors are mere tools to be used and directed by any craft so desiring.

If the welding processes are tools, it might be interesting to learn how hod-carrying and ditch-digging became crafts. Surely welding is distinctly an occupation as either of these.

The correcting of this situation would be easy!

If the War Production Board desires to correct the situation, it can do so simply and readily. The solution, one that would assure peace for welding labor from now on, is merely a matter of recognition of welding as a craft by the WPB.

As Westbrook Pegler recently pointed out in his column: "Recently the weldors were assured that the multiple-card racket would be waived through the kindness of the extortioners themselves. They apprehended, however, that the hundreds of locals around the country would not respect this concession.

"So, the public owes the weldors a hearing and Congress owes them relief as men driven to desperate folly, verging on military sabotage, by the racketeers of an archaic and dishonest union system."

It is high time the WPB begins to right a gross injustice in the ranks of labor.

Magnetic Clamping

Magnetic clamping is gaining favor in west coast shipyard—speeds production.

By
J. M. WHARTON
Los Angeles

ELECTRO-MAGNETS are finding numerous applications in shipbuilding on the Pacific Coast. Their chief use at present is in connection with welding operations. In this connection they have been used advantageously in three ways which help speed up production, for example: (1) Drawing plates together; (2) aligning plates, and (3) drawing stiffeners down to plates.

These magnets, which may be obtained in many sizes, are wound for 40 volts and may be energized by any standard electric arc welding generator. Those used in the shipyards are usually about 15 in. in dia., weighing 180 lbs.

One of the ways in which these magnets are used is pictured in Fig. 1. Plates are laid on the welding platform by a crane, but since the crane cannot be controlled too closely they must be aligned either by hand or mechanical means. This is where a magnet is employed and it is accomplished with astounding simplicity.

When plates are drawn together invariably one is higher than the other. In most cases level alignment was obtained by one of several methods, such as, welding on temporary clamps and forcing wedges between the clamps; or by using a heavy concrete block to level the plates. A magnet does this easily. The magnet is so placed as to straddle the seam. When energized in this position both edges are at once brought flush against the perfect surface of the magnet. The welder now tack welds the plates on each side of the magnet to maintain alignment. This is a quick and satisfactory solution to the problem.

The plans of Maritime cargo ships specify that a reinforcing angle be welded across each plate at 27 in. intervals. When the angles are put on the plates, however, they seldom come down evenly, often due to warp in the plates. Consequently it is necessary to draw the stiffener angles down to the plate. Here again straps the practice has been that of welding around the stiffener and then a steel wedge has been driven between the strap and top of stiffener to force the stiffener down to the plate. The weldor could then tack the stiffener to the plate, after which his helper would remove the strap with a sledge. In this operation it was found that often a portion of the welding bead remained on the plate or else a part of the plate was torn away with the strap. In either event additional work was required. A chipping and grinding job was necessary to get the bead off the plate or else additional welding to fill in the gouge.

Fig. 3—In this setup it is claimed the magnets exert an upward force of 4500 lbs.

Magnets can be used to eliminate the use of straps and wedges. Although a number of different set-ups are possible, the following procedure is standard. A magnet is placed on each side of the stiffener and a slotted "strong-back" is put across the stiffener as is shown in Fig. 3. This strongback fits into 1-in. studs on the magnets. The stiffener is then forced down by the plate by the use of two handwheels threaded to the studs. Because of the tremendous pull of the magnets, weldors and workmen can walk about freely while the plates are magnetized, without in the least disturbing their alignment or tight position against an angle iron or stiffener.

Fig. 1—Note the separation in plates before the magnet is energized.

Fig. 2—When the current is turned on magnetic forces pull the plate into perfect alignment.

A Survey of Aircraft Resistance Welding Equipment

Modern resistance welding equipment is described and discussed. The advantages of stored energy welding are given.

L. P. WOOD
Materials Engineer, Airplane Div.
Curtiss-Wright Corp.
Columbus, Ohio

CONDITIONS in the world today point to one very definite conclusion and that is that the airplane is one of the most important factors in deciding the eventual outcome. For this reason, national defense points attention to the need for airplanes in tremendous quantities. This, in turn, means that high-speed production methods must be thoroughly investigated and applied to the production of aircraft wherever this can be done without sacrificing quality.

Resistance welding, and spot welding in particular, have probably received as great a boost due to the present emergency, as any other means of aircraft fabrication. Spot welding has been used in the fabrication of aircraft for a number of years, but only in the past year or two has it been so much in the limelight.

It is apparent even to a layman that one of the real stumbling blocks in the high-speed production of aircraft exists in the necessity of driving a staggering number of rivets. Quantity of rivets ranges from 50,000 to hundreds of thousands for airplanes of all-metal construction depending on whether they are single place pursuits or multi-engine bombers. Spot welding offers a very attractive alternative.

A great deal of credit must be given to welding machine manufacturers for the development they have made in methods of spot welding in recent years. It has been in a large part due to improved quality of welds resulting from these new methods that spot welding has been so highly successful.

As an introduction to the three new methods of spot welding which I will discuss it is interesting to note that not one of them uses the old conventional A-C method with vacuum tube control. New developments in welding equipment are aimed at three things: higher quality welds, faster production and decreased power consumption. Due to the high currents necessary to weld alloys used in aircraft, mainly aluminum, the greatest effort has been directed to decreasing power requirements.

Unidirectional Current

The most recently developed method is a three-phase process which uses rectified or unidirectional current for the actual welding. The diagram in Fig. 1 shows the schematic principle by which this method is accomplished. Essentially, it consists of passing the current from the three-phase power supply (*A* in Fig. 2) through a special transformer with one set of the three coils reversed or inverted so as to give a 60-degree spacing between wave forms (*B* in Fig. 2) instead of 120 degrees. The resulting current is then passed through a three-phase rectifier, consisting of three ignitron tubes which not only rectify the current but also act as contactors for making and breaking the current. The firing of tubes is controlled by an electronic timing panel. The rectified or converted current (*C* in Fig. 2) then passes through the welding transformer and is amplified in the usual manner. The resulting secondary current or welding current (*D* in Fig. 2) has characteristics which make it more suitable for the welding of aluminum alloys than the conventional A.C. wave form. The current rises to its maximum in less than 1/100 second, holds this value for a short period of time and then drops to zero in an extremely short period of time. This is shown in *D* and *E* of Fig. 2.

The operation of the welding sequence from depression of the foot pedal to release of the electrodes from the work is, of course, entirely automatic. This automatic sequencing of operations is accomplished by the timer panel which houses the main ignitron tubes and accessories necessary for controlling them. A wide range of aluminum welding operations is permitted because the weld time can be varied anywhere from a maximum of approximately one (1) cycle down to one-sixth (1/6) cycle. Such fine control permits welding of very thin sheets up to two pieces each ⅛ in. in thickness.

The mechanical features of the equipment are similar to standard pedestal-type welding equipment. Welding pressures are obtained through a conventional direct air-operated pressure cylinder which is mounted on the upper arm and actuates the upper electrode to move it against the work. Provision is also made for the upper electrode to follow through as the weld is made. After the work is under pressure, an

* Presented at the Annual Meeting, A. W. S., Philadelphia, Pa., Oct. 20 to 24, 1941.

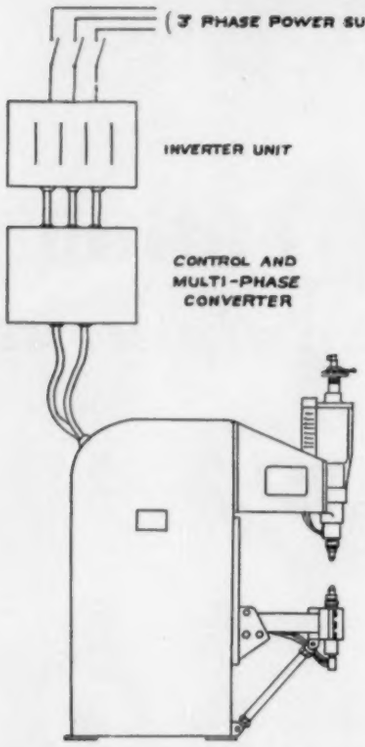


Fig. 1

air-operated secondary shunt grips the upper electrode, thus assuring a more positive connection between the welding transformer and the work. The equipment also provides for conventional automatic repeat timing. A double cylinder arrangement can also be provided to give a forging pressure in addition to a welding pressure.

High Speed Welding

This welding process has an advantage over the stored energy types in that it does not have to take time for a charging process. Welding power comes almost directly from the line. Speeds up to 100 welds per minute are possible. Speed is practically only limited by the speed with which the operator can move the work between welds. However, this method of supplying welding power results in this type of machine requiring a much larger power supply than stored energy types and only slightly less than conventional A-C machines. Also, it does not compare favorably with stored energy types of machines in the matter of frequency of tip cleaning, which is one of the most important factors in obtaining high-speed production. The latter machines can obtain from two (2) to four (4) times (or more) welds before having to clean tips than the former.

Due to the fairly short time this machine has been on the market and in use, very little actual data have been published concerning the welds produced by the process.

Stored Energy Welding

The second newest process offered to the industry for the spot welding of light-weight alloys is the condenser discharge welding or capacitor type stored energy welding. The capacitor type stored energy method was introduced in Europe in 1938 by a Paris manufacturer, Languepin. Several units were installed in France and other European countries. However, it was not until this type of welder was introduced into this country by American manufacturers that it was more widely adopted and more information was obtained to prove its practicability for use in the production welding of aircraft parts.

This method operates on the stored energy principle. The sequence is completely automatic and the charge and discharge of the stored energy are electronically controlled. A schematic diagram of one manufacturer's welding power circuit is shown in Fig. 3. Briefly, during the time interval between spot welds, the capacitor bank is charged to a preset voltage level and to make the weld is discharged into the welding machine.

Features of this equipment include means to manipulate the wave form of the discharge current by simple, flexible control, using electronic tube switching. Also, particular attention has been paid to designing a light-weight frictionless electrode head to permit "follow-up" of electrode pressure. As in other types of D-C welders the kva. demand is a balanced three-phase load of high power factor and the demand required from the power lines is greatly reduced as compared with the single-phase A-C welders. Assuming an average duty cycle, the kva. demand of balanced three-phase load for a welder operating on stored energy is between ⅓ and ⅕ of the demand required by a single-phase A-C welder. This figure varies slightly depending on duty cycle and thickness of material being welded.

Welding power is supplied by energy taken from an ordinary single- or three-phase shop supply line. The three-phase power is converted into high voltage D-C by means of controlled rectifier tubes and is then applied to the capacitor bank where the energy is accumulated over a relatively long period of time, usually several times that required to discharge this energy. After a preset, measured quantity of energy has been accumulated in the capacitor bank,

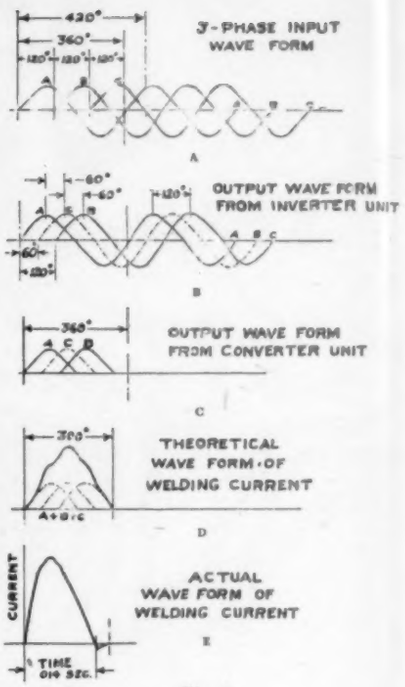


Fig. 2

operation of the electronic control tubes causes the capacitor bank to discharge directly into the primary of the welding transformer as a single unidirectional current impulse magnified many times by the transformer to produce the current necessary for making the weld. The discharge is accomplished by firing a series tube which completes the circuit from the capacitor bank to the welding transformer. The energy is locked in the welding transformer by operation of a tube which is shunted across the primary terminals. This permits the induced or welding current to decay along an exponential curve until all energy is dissipated.

Changes in wave shape are accomplished by changing the transformer turn ratio or the value of capacitance. Increasing the turn ratio with voltage and capacitance constant causes a less steep wave front or a more flattened out wave. Increasing the value of the capacitance with voltage and turn ratio constant raises the current peak and causes a more steep rate-of-decline. However, the slope of the wave front (rate-of-rise) remains constant.

Stored Energy Variations

Another welder of this type operates on a principle similar to the first one described. A schematic diagram of this welder is shown in Fig. 4. To operate, a switch (*S1*) is closed which supplies three-phase power to the rectifier transformer (*T1*). This power is rectified and charges the capacitor bank (*C*) with D-C. The

voltage across the capacitor bank rises until it has reached a sufficient value to operate the coil of a relay (*S2*). The voltage to which the capacitor rises is determined by the setting of this relay. This, in conjunction with the value of capacitance used, accurately determines the amount of energy stored in the capacitor. When this relay operates the power switch (*S1*) opens thereby cutting off the charging current. A contactor (*S3*) between the capacitor and the welding transformer (*T2*) primary is automatically closed, thereby discharging the energy stored in the capacitor through the primary of the welding transformer. This, in turn, induces a flow of current, which is magnified many times, in the secondary of the welding transformer and a weld is made. Since the amount of energy used in making the weld is the energy stored in the capacitance, which can be controlled very accurately, less the fixed losses inherent in the machine, this system provides for welds being made with uniform and accurately measured amounts of energy. This is highly important in the welding of light alloys for aircraft.

More recently a third manufacturer has put a condenser discharge welder on the market. The principle is similar to other condenser discharge machines. The three-phase power supply is rectified into high voltage D-C which is used to charge the condenser bank. Suitable controls cause the condenser to discharge a unidirectional current impulse through the welding transformer. The wave form of the discharge current can be varied by changing the amount of capacitance, condenser voltage or the welding transformer turn ratio.

The welding head of this machine is actuated by a motor-driven cam which operates an air pressure device. This device is so designed that a variable pressure may be applied to the work. That is, a high pressure is used to bring the work into intimate contact, pressure is reduced for welding and is then raised again to provide a forging action on the welded metal.

Electromagnetic Process

The third of the new types of spot-welding machines presented in this country in recent years is the electromagnetic stored energy process. This is the only one of this type of stored energy welder used in the aircraft industry in this country. The first installations of this type of equipment were made about three years ago.

The background of this welder is quite interesting. The first machine was developed as far back as 1927 and was successfully used by a French aircraft manufacturer in the spot welding of structural aluminum alloy members. Since then a great amount of research and development has been carried on to provide a machine capable of being adopted in a practical and rational manner to the needs of the fast growing aircraft industry. Hundreds of machines were built and put into use in various European factories and in 1938 a definite effort was made to establish business in this country. Today, practically every major American aircraft manufacturer is operating one or more electromagnetic stored energy type of welders. Also, stored energy machines of the electromagnetic or condenser type account for practically all of the installations being made in aircraft plants today for the welding of aluminum alloys.

Electromagnetic Principles

As stated previously this welder is the only one which operates on the electromagnetic stored energy principle. The fundamental parts of this machine (see Fig. 5) consist of a rectifier which receives three-phase A-C from the power supply and converts it into D-C; a transformer for energy storage, which receives the D-C and stores it over a period of time; a contactor and a maximum current relay interposed between the rectifier and the transformer. The relay serves the purpose of causing the contactor which is a multiple type to open at a preselected value, thus regulating the amount of energy stored in the transformer. Upon interruption of the charging current in the primary winding, the electromagnetic energy stored in the transformer is discharged through the secondary which is connected to the electrodes which are closed prior to the storing of energy.

This machine was the first to incorporate the variable-pressure cycle. This consists of applying a high initial load on the work to establish uniform contact, decreasing the pressure for welding, and raising it again to

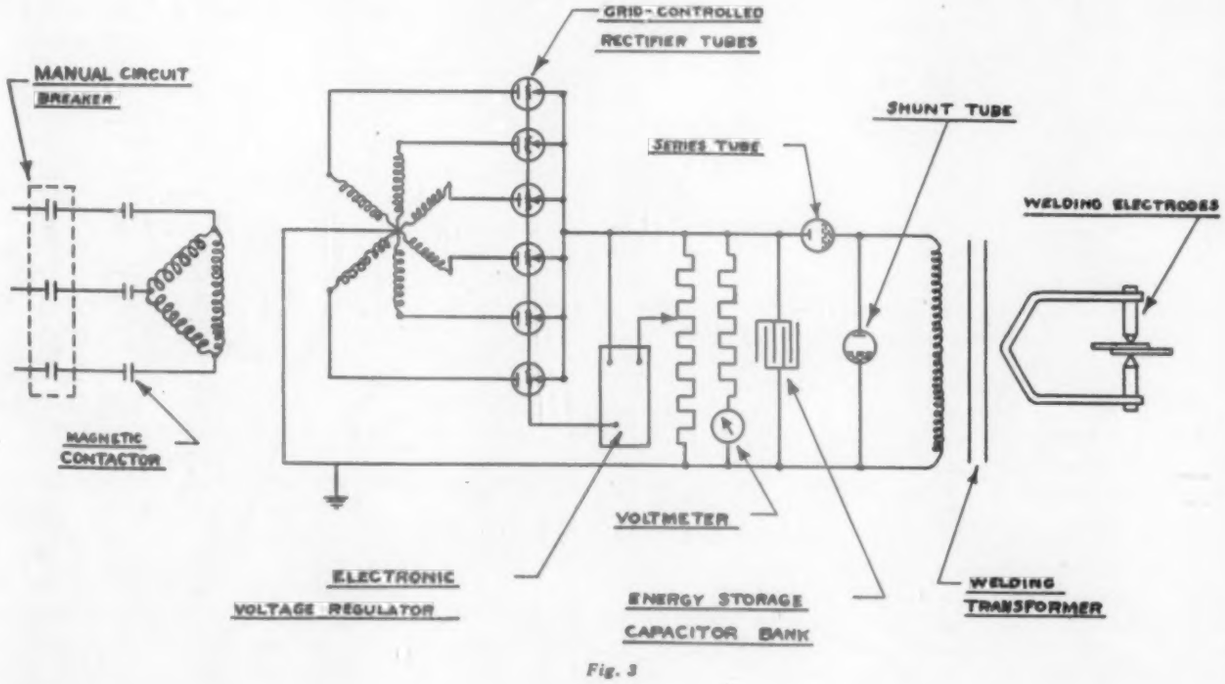


Fig. 3

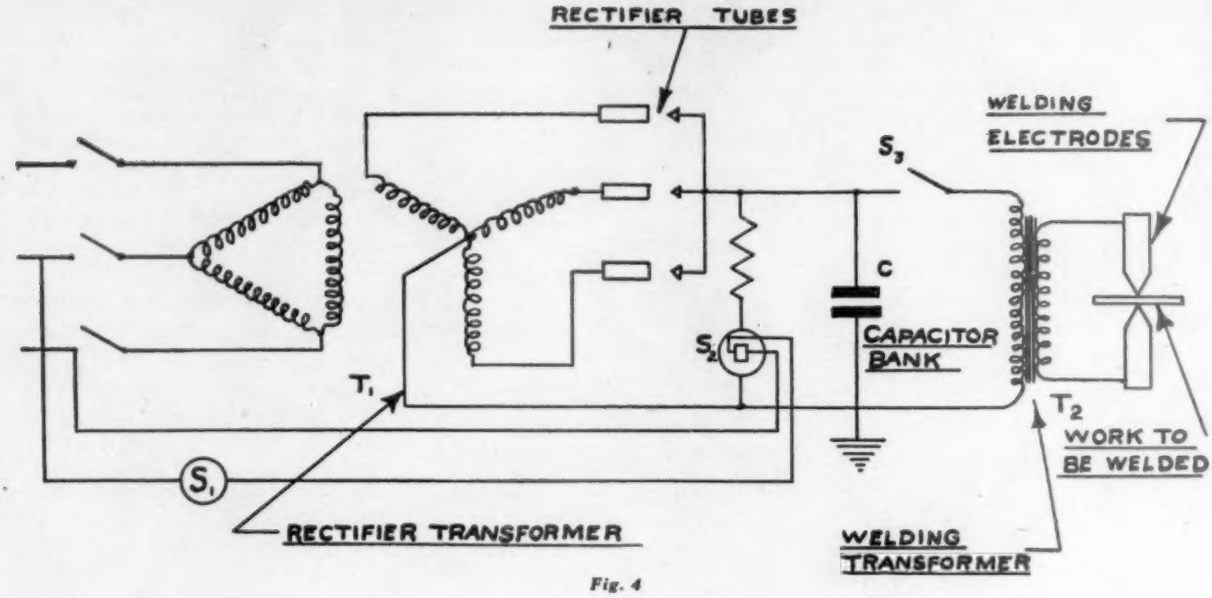


Fig. 4

mechanically work the weld while it is still hot. Also, due to the fact that the electrodes must be closed while energy is being stored, a small negative current flows which serves to slightly preheat the work. This aids in bringing the work into contact and possibly reduces the tendency for the metal adjacent to the weld to develop fine fractures as is sometimes the case when the temperature gradient between this metal and the weld itself is too steep.

Welder Features

Several other features which have recently been incorporated are worth noting. A retractable head can be provided which permits opening the electrodes to approximately four (4) inches for insertion of the work and closing to ½-in. gap for welding. This is a feature found previously on other machines. To increase contactor life and shorten the breaking time, the number of contactors used to break the charging current has been increased from four (4) to eight (8). The addition of a short-circuiting contactor decreases the time necessary for the decay of current. This changes the wave form slightly and permits a faster welding cycle. Provision has also been made for connecting another storage reactor in parallel with the main reactor. This cuts the charging time approximately in half without increasing the preheating current. This is possible because the main reactor only has a secondary winding. The two reactors have similar characteristics so that the current rise in each is equal. These improvements have been directed at decreasing the length of the welding cycle without decreasing weld quality. They have increased the welding speed to a point where it is compatible with the maximum speed with which a skilled operator can manually handle the average type of aircraft assembly in a spot welder.

Why Stored Energy

New developments have also been directed at reducing the arcing of the contactors used to interrupt the charging current. This is important because energy delivered to the secondary for making the weld is affected by any energy which may be lost in arcing, and whenever current is interrupted by mechanical contactors there is bound to be a certain amount of arcing. Consequently, if there is a variation in the degree of arcing there will be a variation in the amount of energy delivered for successive welds. Since arcing of mechanical contactors cannot be eliminated entirely the primary object is to reduce it to a minimum and to provide for uniform control of the degree of arcing.

The majority of this discussion of newly developed aircraft resistance welding equipment has centered about the stored energy method. The process described first, which does not utilize the stored energy method, nevertheless aims at accomplishing the same results by a somewhat different principle.

The question naturally rises "Why stored energy?" The reasons are logical and conclusive and are borne out by the results. They can be briefly summed up as decreased power consumption, improved quality of welds and higher production.

High Power Factor

While perhaps not the most important reason for the initial development of the use of stored energy for resistance welding, but probably the first, is the problem of power supply. Low contact resistance and low internal resistance of the light alloys used in aircraft necessitate the application of an extremely high current to obtain sufficient heat for welding. This means that a very high kva. value is required to overcome the impedance of a standard secondary circuit. When using the conventional A-C method with electronic control, there is a high instantaneous demand on the power system. This load is always single phase and at a very poor power factor. This unbalanced load of low power factor creates a very undesirable condition in three-phase systems. It interferes with the functioning of other electrical equipment in the system and causes trouble at the central power station. Penalties are usually imposed by power companies for this type of load. Currents being heavy and of low power factor, even though they are intermittent, make necessary the installation of heavy power lines which are quite expensive. To combat the poor voltage conditions created it was usually necessary to install large and expensive transformers for spot welders only. This condition was bearable when plants had only one or two machines, but in these days of rapid plant expansion when ten to twenty machines in one plant are common, it would have been an almost impossible situation but for the use of stored energy. It should be brought out, however, that impartial surveys have been made comparing the cost of installing and operating A-C type of machines against stored energy types. The installation costs of the two are about equal.

However, operating costs definitely favor the stored energy types when tip life, improved line power factor, higher production and other items are taken into account. The method by which the use of stored energy reduces kva. demand is simple. The storage system receives its charge over a relatively long period of time, although it is discharged in a very short time. This long storage time, which is the time when power is being taken from the supply line, thus creates no high instantaneous demand. Interposing a three-phase rectifier between the power supply and the storage system gives a balanced load of inherently high power factor. Another important feature is that consistency of welding currents is less affected by line voltage variations in stored energy machines than A-C machines.

Light Alloy Welding

The second reason lies in the inherent welding characteristics of the light alloys themselves. The reason why resistance welding of the light alloys presents more problems than the ferrous alloys can be attributed to two characteristics, their relatively high thermal and electrical conductivity and their critical melting point. The former means high currents are necessary and the latter means they must be very accurately measured to confine the resulting temperature within a very short range. There has been some talk of the "wave form" best suited for the material to be welded. At the present date discussion of this subject must be limited almost entirely to theory. The best "wave form" for welding a particular metal is a function of the metallurgical, electrical, thermal, and other characteristics of the metal, all of a complex nature and involving a very thorough investigation to properly evaluate this wave form. However, we do know that the light alloys require high currents and the application of these currents must be limited to a very short time. The energy delivered by stored energy type welders conforms to these requirements. Therefore, it can be said that, in general, the wave form of stored energy welders is more suitable for welding light alloys than an A-C wave form. Stored energy machines permit alteration of wave forms. However, at the present, this alteration of wave form for different materials is limited to the use of short-duration waves for light gages and longer-duration waves for heavier gages.

Higher Production

As a third reason for the use of stored energy, the production of higher quality welds at as high or higher production rate is emphasized. This might be better stated as an inherent feature of the stored energy method. Higher electrode pressures are possible with the higher current values. This is a definite step in the elimination or minimizing of weld cracks and porosity. The use of shorter welding time has also contributed to this as well as causing less effect of the heat on areas of the parent metal adjacent to the weld region. Pick-up of metal on welding tips is considerably decreased thus cutting down the frequency of tip cleaning and permitting higher production. The external appearance of the weld is improved in that there is less deformation of the sheet and less of a tendency to "burn" or oxidize. Summing up these qualities, welds made by the stored energy method are definitely of higher mechanical strength and possess a great degree of uniformity. This makes possible the designing of spot weld stressed members with an exactness approaching that of riveted construction.

Conclusion

This paper has made no definite attempt to evaluate the superiority of one type of equipment over the other. I have only attempted to present in a general manner the present status of aircraft resistance welding and resistance welding equipment. It is my opinion that stored energy welding will eventually completely replace the A-C method for resistance welding of light alloys, and that this is only the beginning of an intensive development of the use of spot welding in aircraft. THE END

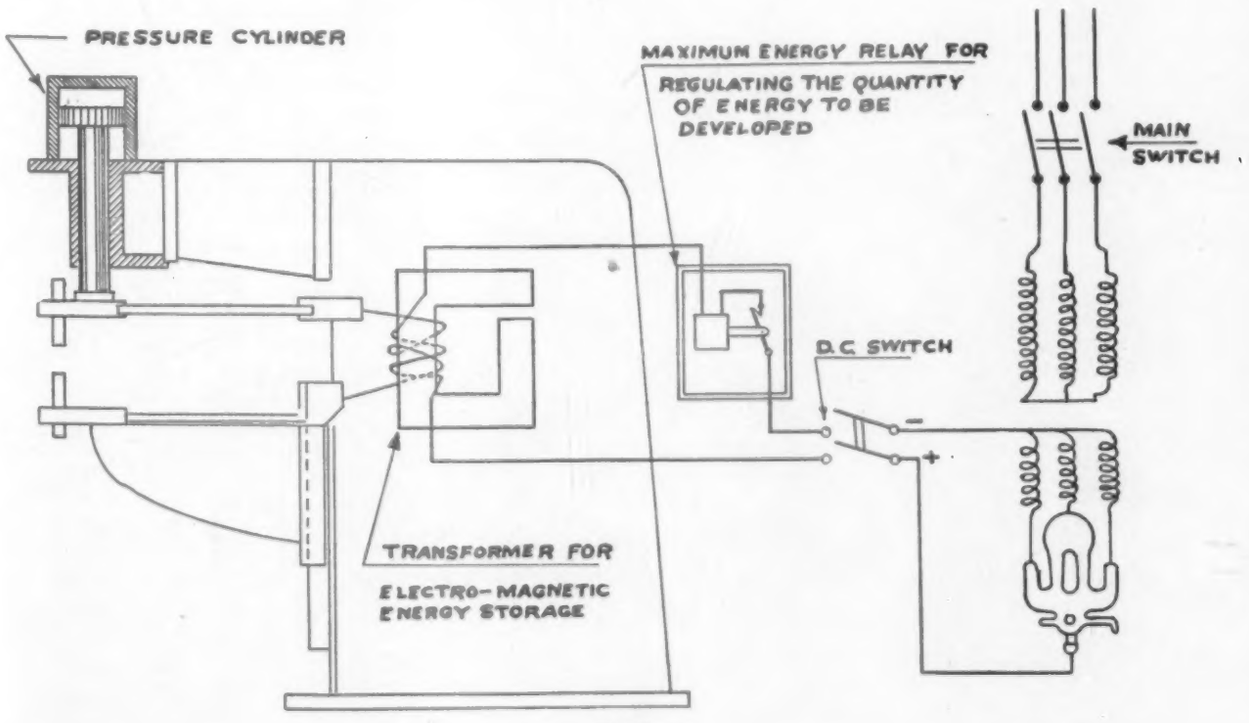


Fig. 6

Fig. 1—The continuous bucket gold dredge of the South Platte Dredging Co. near Fairplay, Colo.

All photos Lincoln

Maintaining Mining Machinery

The welding processes are playing an important part in placer mining operations. Examples of the uses of welding in maintenance and construction are cited.

IN RECENT years mining activities in the West have been on a constant increase. This has been especially true in gold mining operations. The increase in the value of gold saw the beginning of many new hard rock and placer operations.

These new operations have brought about a vast change in placer mining practices. The old time prospector with his pick, shovel and pan has faded from the picture. Mining is now carried on in a big way, huge dredges costing hundreds of thousands of dollars are now used to scoop up gold. The pan and the sluice box is still in use but in the big operations the dredge is the money maker.

Dredging Methods

Gold dredging is carried on by one of two methods in placer operations. One method involves the use of a dragline and a separator unit. This equipment is used primarily on narrow and shallow gold bearing deposits, deposits that would not be profitable if worked by the larger continuous bucket ladder dredge. Where the deposit of gold is both deep and large in area, the continuous bucket placer dredge is employed. This type of equipment is capable of searching for gold through beds of mud and gravel to depths of 125 ft. or more.

It is seldom that placer mining equipment of both types are found working close together but this is the case in the mountainous regions around Fairplay, Colo. A view of the continuous bucket is shown in Fig. 1.

This is a modern unit over 400 ft. in length which is operated by the South Platte Dredging Co., Denver. This unit which is electrically operated, tends to place gold production on a streamlined basis. Aided by heating units, it is expected to be suitable for year round operation despite the possibility of temperatures of —50 F. or lower.

The hull of this complete gold dredging plant is of riveted steel construction. The plant itself besides the latter with its continuous buckets for scooping up mud and sand and gold, is composed of a trommel screen which receives the aggregate from the bucket conveyor and segregates it according to size, discharging the larger stones and passing the fine particles on to the riffle table. Water flows over the riffle table washing out the lighter particles (sand and gravel) while the free gold settles and is collected in the serrations in the riffle plates. The dredge also houses a diesel power plant which supplies electric power for operation of the equipment. Tailings, (the large left-over stones), are removed from the end of the trommel and conveyed to a pile by the stacker shown at the far end of the dredge.

Welding Requirements

Welding work aboard a plant of this type requires the full time of an experienced welding operator. Much of the welding comprises structural work such as the welding on the inside of the hull seams to make this riveted hull water-tight. All deck plate, stairways, deck house, railings, are also of welded construction. The riffle screens, over which the fine aggregate passes and the gold is collected, are also of welded construction.

Keeping such a unit in operation involves continued maintenance and because of its versatility welding is

Fig. 2—Welding is handy for relining the spud chute.

ideally adapted to the job. If there is a broken part to be replaced it is found that oft times it can be repaired by welding more quickly and cheaply with less time involved. If it were not for the welding and cutting processes and the skill of the weldor, many placer operations would not be practical. The plant is usually located too far from a source of replacement parts and the delays that would be incurred, if it were not for the quick repairs made possible by welding, would be too costly to make operations profitable.

Hard-facing Applications

One of the more notable applications of hard-facing is the building up of the heel plates for the upper tumbler — the part which drives the bucket chain as well as carries the load of the upper part of the bucket line before the aggregate is dumped into the trommel. The back of the bucket which contacts these heel plates is also built up, in this case, with an alloy electrode which has been found to give better service than any other hard-facing electrode.

Another welding maintenance application is shown in Fig. 2. Here a weldor may be seen re-lining the spud ground chute with abrasion-resisting plate. Aggregate tailings are side-tracked to this chute when a new spud (anchor) location is desired. The aggregate dumps around the spud which holds tail end of the dredge in place so that the front end can be swung back and forth continuously. The aggregate dumped through this chute provides an anchor for the spud. The plates are laid over the old worn chute. These plates are 5 in. wide by ½ in. thick.

The lips of the bucket, however, are subjected to the worst wear of any of the parts of the placer dredge. When in operation they are continuously scraping over and bumping against bed rock and other abrasive objects as the bucket reaches the bottom of its travel. As a result the bucket lip wears to a razor edge and then begins to curl back resulting in decreased production.

Production Problems

This production decrease is due to two reasons: (1) The bucket cannot pick up the gold particles because the curled lip passes them over rather than picks them up and (2) the curl retains the gold in the bucket to be lost as the bucket re-enters the water rather than dumping it on the trommel screens. The weldor, however, with his hard-facing electrode, readily corrects this situation by making the lip self-sharpening. This is accomplished by coating the inner surface of the lip because hard-facing materials will withstand abrasion but will not curl.

The dragline and separator unit in operation at Fairplay is owned by the Timberline Dredging Co., Denver, who also operate a bucket dredge nearby. This units is the second largest of its type in the world. It consists of an 8 yd. walker type dragline which digs the aggregate and feeds it into a hopper in the washing plant (separator unit) mounted on a welded steel floating barge.

Construction Welding

The use of arc welded pontoons for floating the washing plant is unique in that riveted steel and wood planks are usually used in the construction of such hulls. The ease with which water tight joints are obtained makes welded steel construction preferred.

Fig. 3 is a general view showing seven—8 ft. x 50 ft. x 6 ft. 2 in. deep pontoons in the pit which eventually was flooded to form their working pond. When three more of these pontoons were completed, the ten were tied together to form a barge 80 ft. long x 50 ft. wide by 6 ft. 2 in. deep. It was on this barge that the washing plant was installed which consisted of a receiving hopper, trommel, (revolving screen which segregates the gravel according to sizes), riffles, (on which the free gold is separated from the gravel) power unit and stacker for tailings.

The methods used in constructing these pontoons are worthy of men-

Fig. 3—Fabricating steel pontoon sections for a steel barge to carry a dragline separator type gold dredge.

tion. Fig. 4 is a view looking down into one of the pontoons showing the frames and diagonal bracing. The 50 ft. longitudinal frames are all shop-fabricated, (two are used in each pontoon). Welding in the field consisted of building an all-around framework with the shop-fabricated frames running lengthwise as shown. These sections were 8 ft. wide and 6 ft. 2 in. high. The longitudinal frames were built from 3½ in. by 2½ in. by ¼ in. angles, top and bottom, and 2¼ in. by 2½ in. by $\frac{3}{16}$ in. angles diagonal. The framework for the sides of the pontoon sections was built from 3½ in. by 2½ in. by ¼ in. angles running longitudinally with 3 in. channels running vertically between the angles as shown. Diagonal braces of 2½ in. by 2½ in. by $\frac{3}{16}$ in. angles tie in the longitudinal frames with the tops and bottoms of the sides. The diagonal braces and the side channels come together at the same point and are spaced 5 feet apart.

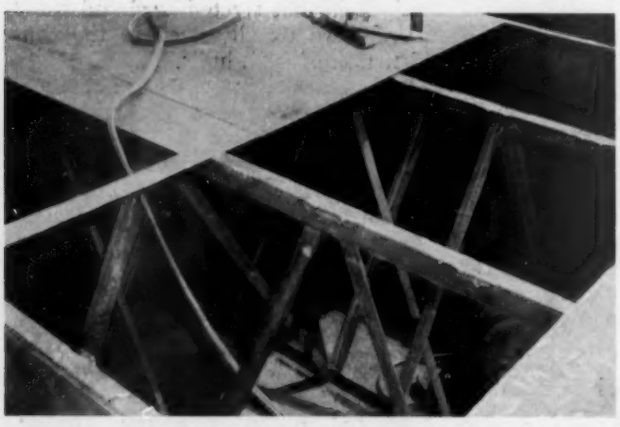


Fig. 4 — The interior bracing of one of the pontoons pictured in Fig. 3.

Fig. 5, an interior view of one of the pontoons shows a weldor at work joining the deck plate to the top flange of one of the longitudinal frames. The diagonal angle braces appear in the foreground. All plating is welded to the framework downhand except the top deck inside which is welded overhead. The pontoon sections are turned to permit downhand welding wherever possible. Joints in the plating are straight butt. The plate is first tack welded, then one pass is made inside and outside.

For safety, each pontoon was separated by bulkheads into three watertight compartments. These compartment bulkheads of ¼ in. plate are built into each pontoon section at the ⅓ and ⅔ way marks. This confines water filling to ⅓ of a pontoon section when damage occurs at any one point since each compartment is a leakproof tank. One compartment in one of the pontoons will be used for storage and fuel oil, for use in the diesel power units of the washing plant. The deck, bottom and hull plates of the pontoons are $\frac{3}{16}$ in. in thickness.

Fig. 5—Welding joins the deck plates to the frames.

Maintenance on a dragline type of placer dredge is practically the same as that of a contractors' dragline. Since the machine is always working in rough terrain and handling boulders and gravel the wear and tear on the equipment is severe. There are always welding jobs to be done —buckets to repair, teeth to rebuild and hard-face, parts to repair and structures to reinforce. Literally thousands of jobs which require the services of the welding crew to keep production on schedule.

Welding and weldors are becoming an important part of mining operations. Not only is welding used to build mining equipment but it also serves to keep it in operation and to maintain production at the highest level.

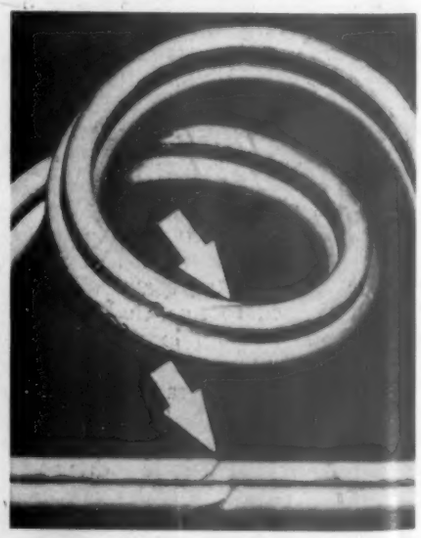
THE END

Silver Soldering for Mine Cables

AS MINING operations are extended, both the tracks that carry the mine cars and the copper trolley cables from which they get power to operate must often be extended and shifted to new locations. Installation men, in an effort to speed up this work and save the metal in the large brass splicers they have used in the past for extending cables, have experimented with low temperature silver alloy brazing and find that brazing is far less costly and more efficient than the methods formerly used.

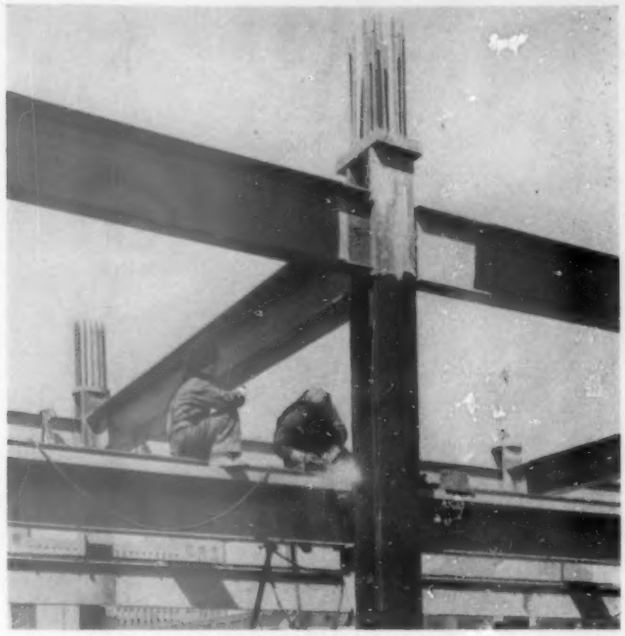
When instructions come through for an extension of tracks the end of the existing cable and the new cable to be added are cut diagonally with a hack saw (see the illustration). The two pieces are then butted together and held firmly in place with a suitable jig. The surfaces to be joined are brushed with a low temperature brazing flux which is active at 1100 F. Heating is done by oxy-acetylene torch which brings the joint up to brazing temperature rapidly. A silver brazing alloy flowing at 1175 F. is touched to the heated parts as soon as they show a dull cherry red heat, it penetrates instantly throughout the joint. This operation takes only five minutes and provides a connection which electrically is as efficient as a continuous cable. The strength of the braze also is as high or higher than that of the solid cable. As a joint of this type is free from internal oxidation, the need for cleaning or other maintenance is eliminated.

The gases for heating and the brazing alloy for the job illustrated cost only five cents for each complete braze. The brass splicers formerly used cost about $1.23 each. This cable joining method saves time and improves joint quality. Its effectiveness may also suggest other metal joining operations which will release metals needed for war materials, now being used for repair and maintenance.



Silver solder saves $1.18 over the brass connection on this cable splice.

★ PRIORITIES



Defense building is hastened by the use of welding.

T. B. JEFFERSON
discusses

Priorities for Welding

An important change has been made in the Application for Priorities Rating form. A new Rating Order for welding schools. The Jobber problem is discussed.

PRIORITIES are confusing, primarily because of their newness but also because of the frequent changes made necessary by false starts. There have been and will be complaints because of these frequent changes which force all of us using priorities to change our ways and learn anew.

Remember, priorities are new to all of us, to those who are making the rules as well as those who are playing the game. It is only natural that mistakes will be made and that corrections will necessitate changes. Each change has been made with a definite purpose in mind. Each change has been made to simplify the priorities setup and to make it easier for all who have to deal with priorities.

Rating Extended

The most recent change that has been made in priorities deals with the old reliable, Form PD-1, which is an application for preference rating. The assignment and extension of individual preference ratings has now been simplified and made more uniform by Priorities Regulation Number 3 which was announced January 12.

Beginning February 2, 1942, individual preference ratings of the type which has heretofore been assigned on PD-1 and PD-3 forms may be extended to suppliers and subsuppliers of the producer who receives the rating by a simple endorsement on purchase orders, like that now used for extension of limited blanket ratings and ratings under the Production Requirements Plan.

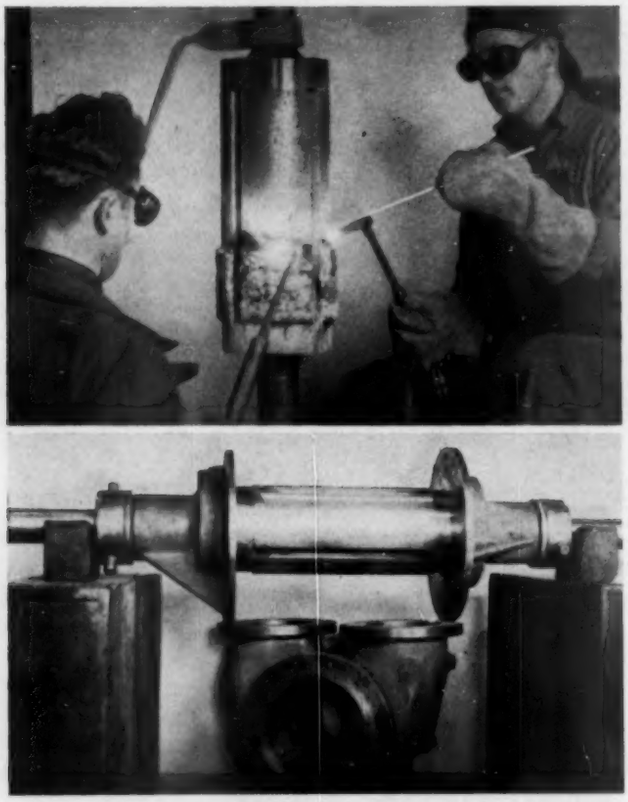
Under an arrangement between the director of Priorities and the Army and Navy Munitions Board, ratings assigned by Army and Navy field officers will no longer be limited to items appearing on the Army and Navy Priorities Critical List. However, under Regulation No. 3, extention of individual ratings will be limited to material which will be physically incorporated in the items originally rated.

Simplified Forms

Two new forms of Preference Rating Certificates, PD-1A and PD-3A, will replace the present forms, PD-1 to PD-5 inclusive, for assignment of individual ratings. Use of the new forms will be optional on and after February 2 and mandatory on and after March 1.

Form PD-1A which will replace Form PD-1 is a simplified blank to be used in making specific applications for materials or supplies when general preference orders do not provide the required priority assistance. When PD-1A applications are approved by the OPM Priorities Division, ratings will be assigned on the form itself. A similar procedure has been standard for some months. Form PD-2, which was formerly used to assign ratings in response to applications on PD-1 forms, will disappear and will not be replaced.

Preference ratings assigned to applicants who use Form PD-1A may be extended on



Priorities are to promote the conservation of material. The reclamation of machinery by welding and brazing is one of the greatest means of industrial conservation.

In this example the welders are rebuilding (upper) a cast steel grain blower shaft. (Lower) The bronze-surfaced shaft has been machined and is ready for service.

and about February 2 to suppliers and subsuppliers of the applicant by the prescribed endorsement on purchase orders, signed by a duly authorized representative of the company making the extension, and will not require a countersignature from any Government officer. Heretofore, preference ratings assigned on PD-1 forms have not been extendible under any circumstances.

Form PD-3A will be used for all applications for ratings in connection with orders from the Army, Navy, Coast Guard, Maritime Commission, Coast and Geodetic Survey, Panama Canal, National Advisory Committee on Aeronautics, Civil Aeronautics Authority, Office of Scientific Research and Development, Procurement Division of the Department of the Treasury, Surplus Marketing Administration of the Department of Agriculture, and contracts or purchase orders from foreign governments. It will replace Forms PD-3, PD-4, and PD-5.

Ratings assigned on Form PD-3A may also be extended to suppliers and subsuppliers without countersignature. Ratings which have been assigned on PD-3 forms were formerly extendible without countersignature only if the amount of the order involved was less than $500.

When an individually rated order is served upon a supplier by the original applicant under the new procedure, the rating may be extended by the supplier, by his suppliers and subsuppliers to obtain any material which will be delivered to the original applicant in accordance with the rating, but neither the applicant, his suppliers, nor subsuppliers may use the rating to obtain machinery or capital equipment which they use in fabricating parts to fill the order. If producers who have been assigned a rating on a PD-1A form need machinery or capital equipment for this purpose which they cannot obtain without priority assistance, they must apply for a separate preference rating on another PD-1A form. Prime contractors who need machinery or equipment to be used exclusively in filling Army or Navy orders may be given a rating for use in obtaining such machinery or equipment on PD-3A forms.

To Replace Inventories

Another important change made by Priorities Regulation No. 3 allows the recipient of an individual rating, his suppliers, and subsuppliers to employ the rating for replacement in inventory of materials used in filling the rated order, provided such replacement does not increase inventories above a practicable working minimum.

If the materials to be replaced are in whole or in part manufactured, processed, assembled, or otherwise physically changed by the supplier, the rating must be extended while the materials are in process of fabrication. For materials which are not processed or otherwise changed by the supplier, extension of the rating may be deferred up to three months, until an order can be placed for the minimum quantity procurable on customary terms. This provision is primarily for the benefit of wholesalers and distributors, enabling them to group their own orders while making deliveries in small quantities.

Multiple Purchases

The new regulation also allows a supplier or subsupplier who has received two or more purchase orders bearing ratings of the same grade to include in a single purchase order or "basket," within the limitations which have been indicated above, any or all of the material which he requires to make deliveries in accordance with the rated purchase orders which have been served upon him. In such case, he must specify in the certification on his own purchase order all of the Preference Rating Certificate form numbers and serial numbers referring to the orders in connection with which he is extending the ratings.

Records and Reports

All persons who receive or extend preference ratings assigned on PD-1A and PD-3A forms must keep records as prescribed by Priorities Regulation No. 1 and make such reports as may be required by the director of Priorities. Use of PD-3A forms may also be subject to such further requirements as may be set forth by the Army and Navy Munitions Board with the concurrence of the director of Priorities.

Preference Rating Certificate Form PD-1A may be reproduced in blank by or for any user, but Preference Rating Certificate Form PD-3A may not be reproduced. PD-1A forms may be procured from the Priorities Division of the Office of Production Management either in Washington or in field offices. PD-3A forms may be procured from contracting and procurement officers of the Army and Navy.

Priorities have made lots of material available for the construction of aircraft jigs.

Copies of the new forms will be distributed to applicants by the Office of Production Management or the Army or Navy immediately after February 2, 1942.

School Rating

A new preference rating order has been issued of interest to the welding industry in that it deals with welding schools. This is Preference Rating Order P-92 giving priority assistance for deliveries of steel plate and welding electrodes to be used in the operation of defense training classes for weldors under the United States Office of Education program which has been set up in 22 states. To date, no specific preference rating has been assigned to deliveries of steel plates and welding electrodes. The rating will be determined from time to time depending on requirements.

Positioners help speed production.

Jobber Problems

Jobbers are frequently confronted with the problem of what to do about priorities when they do not know exactly how, when, or where they are going to sell the items they purchase from their wholesaler.

They will find that it will be of considerable assistance if they will keep a record of the percentage of their defense sales and supply the information to their wholesaler or manufacturers as follows: First of all, if you are cooperating with the Production Requirements Plan (Defense Supplies Rating Plan) you should send your manufacturer a completed Form PD-25C; this form is the customer's certificate identifying order under defense rating plan. This form should be sent covering the latest month available and should be sent to the supplier regularly each month thereafter. Remember, the PD-25C form can originate with the jobber and does not have to be "issued" by the manufacturer.

If you already have an actual priority certificate, a PD-3 on a particular order, notify your supplier on a Form PD-25D, which is the customer's certificate identifying order under defense rating plan. This is sent to the supplier with each order. By using the Form PD-25D it is not necessary to extend the actual priorities certificate, but if you have already applied for such an extension, a formal extension will serve as well as a Form PD-25D.

If the material you are buying is for maintenance, repair or operating supplies for industrial plant, any governmental unit, warehouse, wholesaler, retailer, charitable institution, common carrier of any kind, school, publisher, broadcasting station, telephone or telegraph company, hospital, oil well operator or for any individual using the material to repair or maintain the property of any of the above, you should ask your customer to certify an A-10 rating under order P-100 and indorse your order to your manufacturer reading as follows: "Material for maintenance, repair and operating supplies, Rating A-10 under Preference Rating Order P-100 with the terms of which I am familiar."

Another thing that the jobber should remember is that a P-100 allows you to extend this A-10 rating to replace stock you have sold under it within the previous three months, so, if possible, keep track of all sales from stock covered by P-100 and apply the A-10 rating to replacements.

While Priorities at times seem quite difficult and even more confusing, remember that intelligent and conscientious cooperation on priorities is one of the important duties that every business man owes this country. Keep yourself informed and up-to-date on priorities from official sources. This thorough knowledge of priorities regulations is all important to you and to your business. Suppliers and manufacturers cannot promise to continue shipments to those who do not keep the proper records or to those who do not furnish the data necessary to obtain supplies of raw materials to permit the continued manufacture of your requirements.

The illustrations used in this article are credited as follows; Page 41 —General Electric Co.; Page 42, upper — Linde Air Products Co.; lower, Danly Machine Specialties, Inc., and Page 43, upper, Cullen-Friestedt Co., lower, Patterson-Kelly Co.

THE END

Without a high priority rating, copper hot water tanks are not available.

The Technical Slant

The man who doesn't read good books has no advantage over one who can't read them.

Arc Welding

PRACTICAL ARC WELDING. *By W. J. Chaffee. Published by Hobart Trade School, Inc., Troy, Ohio, 1942. Simulated leather, 5¼ x 8 in., 516 pages. Price $2.00.*

Practical Arc Welding is an enlarged and revised edition of "Arc Welding and How to Use It" by the same author, the third edition of which was published in 1938. This revision has been so complete that only the tabular matter and that section devoted to carbon arc welding has been retained, a fact that undoubtedly accounts for the new title.

The book is in 25 chapters and is divided into five sections. Part I is devoted to general welding information. The material covered includes the growth of arc welding; its use; manufacturing applications; available metals and alloys; joints and welds; electrodes and filler rods; strength of arc welded joints; cost of arc welding; characteristics of the welding arc; welding symbols and their use; equipment for arc welding; development of welding personnel. Parts II and III are devoted to the complete series of arc welding lessons. This group of 41 lessons covers preliminary instructions; starting and manipulating the arc; common joints with bare electrodes; welding light gauge sheets with coated electrodes; welding with coated rods in all positions; pipe welding; welding cast iron; special tests; welding with the carbon arc; "long arc" method of welding copper; and specialized applications of arc welding.

Parts IV and V is a dictionary of welding terms with 20 pages of tabular data for operators and designers. There is also an eight page cross reference index.

Mr. Chaffee's new text is easily comprehensible to beginners yet it contains practical arc welding data and lessons of interest to the technical man. Weldors, potential weldors, students, instructors, designers, engineers will find this text suitable for reference or home study work.

» «

WELDING AND ITS APPLICATION. *By Boniface E. Rossi. Published by McGraw-Hill Book Co., New York, 1942. Simulated leather, 6x9 in., 343 pages. Price $2.50.*

The title of this book is somewhat misleading for it should be Arc Welding and Its Application inasmuch as less than ten per cent of the book is devoted to the other welding processes.

The book opens with a discussion of welding and the economy of its use. From there it goes into practical applications of welding, welding terms and definitions and a brief study of the different processes and their basic principles. Chapter V begins the discussion on arc welding followed by a chapter devoted to arc welding equipment. There is then about 100 pages devoted to the technique of arc welding and its problems. The information is the text supplement that is suitable for use with the "Manual of Instructions in Welding and Cutting"* by the same author. In this section there is included data on the use of polarized light for the study of weld joints.

The remaining three chapters of the volume's 16 are devoted to Testing and Inspection of Welds; Flame and Arc Cutting of Metals and Welding Symbols and Their Use. Engineering Data and other useful data form a 12 page appendix which closes the book.

A valuable part of the volume on arc welding is its useful cross index.

» «

Blueprint Reading

SIMPLE BLUEPRINT READING, SECOND EDITION. *Published by The Lincoln Electric Co., Cleveland, 1942. Simulated leather, 6x9 in., 146 pages. Price 50 cents in U.S.A., 75 cents elsewhere.*

In this book there is afforded a basis for the study of blueprint reading, which, together with practice in the actual reading of drawings, will guide the student to proficiency in this subject. While the book has apparently been compiled and published primarily for weldors, it contains information of value for the students learning machine drawing or the draftsman or engineer who wishes to become familiar with welding symbols and welding drafting.

The use of welding symbols on drawings is carefully explained in subject matter and clarified by illustrations. In order that the beginner may be certain as to the meaning of the various symbols some of the drawings are supplemented by photographs of the finished article clearly showing the locations of the welds. There are many illustrations of practical examples of drawings of machine parts, pipe connections, general construction and similar objects of welded construction. In fact, eight pages more than in the previous edition.

Simple Blueprint Reading though not an exhaustive treatise on the subject of blueprint reading, affords a sound basis in the fundamentals and will prove valuable to those interested in welding.

» «

Hydraulics

PUMPS AND PUMPING. *Edited by E. Malloy. Published by Chemical Publishing Co., Brooklyn, 1941. Cloth 5½x8½ in., 104 pages. Price $2.00.*

Pumps and pumping is the fifth volume in the "Complete Engineer Series." As such it is a small yet practical manual on the operation, installation and maintenance of reciprocating centrifugal and rotary pumps.

In six chapters the book discusses reciprocating pumps, centrifugal pumps, well and borehold pumps, rotary and turbine pumps, air-lift and submersible pumps and pulsometer steam pumps.

A valuable section discusses suction and delivery head, friction and pipe losses, and gives some useful formulae on calculating the capacity and efficiency of pumps.

The chapter on centrifugal pumps, the longest chapter of the book, is devoted primarily to installation procedure of this important type of pump equipment.

The principles and construction of the steam driven direct acting pump are also given.

» «

Safety

INDUSTRIAL ACCIDENT PREVENTION, SECOND EDITION. *By H. W. Heinrich. Published by McGraw-Hill Book Co., New York, 1941. Cloth, 5½x8 in., 448 pages. Price $3.00.*

In this new edition, Industrial Accident Prevention is found to be an up-to-date volume on safety work which supplants the first volume to bear this name published 10 years ago. The new edition which has been directed toward key plant executives, will be found equally of interest to students and individuals interested in safety work.

The material which is presented in an orderly fashion, is quite adaptable to text purposes. In the volume's 14 chapters, there is discussed: principles of accident prevention, creating and maintaining interest in safety, fact finding, corrective action, machine guarding, process and procedure revision, safety psychology, fatigue, occupational diseases, illumination, safety organizations, accident statistics and education of employees. Nine appendices cover other features of accident prevention.

Industrial Accident Prevention is an excellent book on the subject. While this reviewer would probably like to see accident prevention with respect to those engaged in welding treated a little more thoroughly, mention is made of welding fumes and burn hazards.

» «

Sheet Metal Work

AIR CONDITIONING METAL LAYOUT. By *Joseph J. Kaberlein. Published by Bruce Publishing Co., Milwaukee, Wis., 1941. Cloth, 6 x 9½ in., 308 pages. Price $3.75.*

Air Conditioning Metal Layout is made up of 171 plates offering practical, short and modern methods in laying out square, rectangular, and transition fittings used in heating, ventilating and air conditioning.

A feature of the book is the fittings described. In most cases, they are combinations which would normally require two or more transitions but the limited

*See *The Welding Engineer*, Dec., 1941, page 42.

space given to sheet metal workers for installation of ducts, elbows, change joints and the like is considered.

Each problem presented is drawn to scale, with dimensions ample for metal construction. The descriptions are clear and well organized, beginning with the various seams that are used to assemble the problems, their required allowance, and the methods of forming them. The demonstrations of these practical problems are made clear and simplified by the illustrations of all the patterns required.

The closing plates illustrate mathematical formulas as applied to sheet metal work, in addition there is a comprehensive index and several mathematical tables.

» «

Shipbuilding

SHIPBUILDING TERMS. *By Fred C. Williamson. Published by American Technical Society, Chicago, 1942. Paper, spiral bound, 5 x 7 in., 64 pages. Price 50 cents.*

Shipbuilding Terms is an excellent handbook which will fill a definite need in this time of national emergency. This small 64 page volume will be found to be an extremely valuable treatise for the new worker in the shipyard.

The first 40 pages of Shipbuilding Terms is in reality a dictionary listing common expressions of the shipyard and give their definition. This is followed by a section devoted to abbreviations of general ship terms. There are also illustrations showing hull plans, profiles and sections of a C-2 cargo ship.

To make this book more valuable there has been included ten assignments containing questions, true and false tests and completion tests so that the book might serve as a text in a shipyard school.

» «

Aviation

FLIGHT — METEOROLOGY AND AIRCRAFT INSTRUMENTS. *By Capt. Bailey Wright, Rex Martin and W. E. Dyer. Published by American Technical Society, Chicago, 1941. Cloth, 6x9 in., 340 pages. Price $3.25.*

Meteorology and Aircraft Instruments is the fourth book of the Flight Series and is a revised and expanded version of material originally published by the Junior Air Service of America, Inc.

The book opens with a study of the atmosphere and approximately half the book is devoted to meteorology, weather forecasting, airway weather service, maps, airway maps, charts, aerial photography and airway markers. In the discussion related to maps and charts it is shown how they are made.

There will be found a very complete treatment of aviation radio while the final chapters of the book are devoted to aircraft instruments, both engine and instruments. This section is particularly valuable because of the complete explanations and accompanying illustrations.

The book is concluded with a series of quiz questions with answers so that the reader may check to see if the contents of the book have been thoroughly mastered.

American Welding Society Codes

THE American Welding Society announces the publication of eleven revised and tentative codes, standards and specifications which are now available to the public. A brief description of these codes follows:

» «

CODE FOR ARC AND GAS WELDING IN BUILDING CONSTRUCTION (TENTATIVE) 1941 edition, 74 pages, indexed. Price 50 cents.

This Code prescribes a set of regulations intended for adoption by municipalities as part of their master building code, to cover the application of arc and gas welding in building construction. It contains 6 sections and 6 appendices as follows: Section 1—General Provisions; Section 2—Design of Welded Connections; Section 3—Filler Metal; Section 4—Workmanship; Section 5—Inspection; Section 6—Qualification; Appendix A—Definitions; Appendix B—Welding Symbols, Appendix C—Prequalified Welded Joints; Appendix D—Qualification of Welding Procedures and Operators; Appendix E—Illustrations of Acceptable and Defective Weld Profiles; Appendix F—Record of Operator Qualification Tests.

» «

STANDARD QUALIFICATION PROCEDURE (TENTATIVE) 1941 edition, 39 pages. Price 40 cents.

A booklet describing a standard method for qualifying welding procedures and welding operators, intended principally for adoption by code-writing bodies. The Standard Qualification Procedure has been incorporated in practically all of the more important codes and specifications on welding.

» «

DEFINITIONS OF WELDING TERMS AND MASTER CHART OF WELDING PROCESSES (TENTATIVE) 1942 edition, 31 pages. Price 40 cents.

The standard definitions of welding terms adopted by the American Welding Society, illustrated by numerous sketches. The booklet also includes a chart showing the subdivisions of the various welding processes, namely: arc welding, gas welding, resistance welding, thermit welding, forge welding and brazing.

» «

WELDING SYMBOLS AND INSTRUCTIONS FOR THEIR USE 1942 edition, 26 pages. Price 25 cents.

A booklet describing the American Welding Society's standard symbols for denoting arc, gas and resistance welds on engineering drawings. The booklet also includes illustrations of the use of the symbols on machinery and structural drawings.

» «

STANDARD METHODS FOR MECHANICAL TESTING OF WELDS 1942 edition, 25 pages. Price 40 cents.

A booklet describing methods for making mechanical tests of welds, including tests for density, soundness, tensile strength, shearing strength and ductility (bend tests). The tests apply to base metal, weld metal, butt welded joints and fillet welded joints. The booklet includes sketches of the specimens and describes the methods of conducting the tests and evaluating the results.

» «

SPECIFICATIONS FOR IRON AND STEEL ARC WELDING ELECTRODES (TENTATIVE) 1940 edition, 7 pages. Price 25 cents.

A specification covering dimensions, characteristics and properties of fourteen different classifications of lightly coated and covered metal arc welding electrodes for the welding of carbon and low-alloy steels.

» «

SPECIFICATIONS FOR WELDED HIGHWAY AND RAILWAY BRIDGES 1941 edition, 108 pages, indexed. Price, Members, 75 cents; Non-Members, $1.00.

A completely revised edition of this standard specification for welding of bridges, covering design, construction and repair. Included are appendices on welding symbols, definitions of welding terms, and methods for qualifying welding procedures and operators.

» «

RULES FOR FIELD WELDING OF STEEL STORAGE TANKS. 1940 edition, 19 pages. Price 25 cents.

A booklet prescribing rules to cover welded construction of bulk storage tanks for holding liquids at substantially atmospheric pressure. The rules cover materials, design, workmanship, inspection and testing.

» «

A.W.W.A.-A.W.S. STANDARD SPECIFICATIONS FOR ELEVATED STEEL WATER TANKS, STANDPIPES AND RESERVOIRS 1941 edition, 43 pages. Price 30 cents.

These specifications prescribe minimum requirements as to the design, fabrication and erection of elevated steel water tank, standpipe and reservoir structures of either welded or riveted construction. The requirements relative to welding are identical to the Rules for Field Welding of Steel Storage Tanks.

» «

RECOMMENDED PROCEDURE TO BE FOLLOWED IN PREPARING FOR WELDING OR CUTTING CERTAIN TYPES OF CONTAINERS WHICH HAVE HELD COMBUSTIBLES 1940 edition, 12 pages. Price 25 cents.

A booklet outlining safety precautions to be taken in order to insure that explosion or fire will not result when welding, gas cutting or performing other hot work on tanks or other containers which have held combustible solids, liquids or gases.

» «

REPORT ON THERMAL STRESSES AND SHRINKAGE IN WELDED SHIP CONSTRUCTION 1941 edition, 12 pages. Price 25 cents.

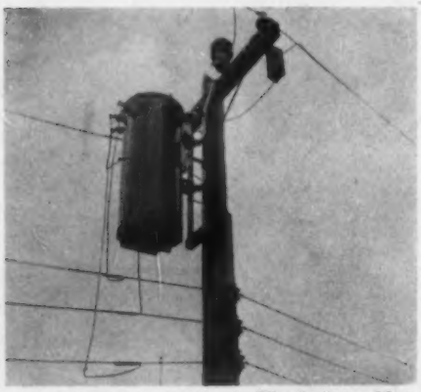
A report on an investigation of the general problem of thermal stresses and shrinkage in welded ship construction, including a description of the principal methods employed to minimize shrinkage and the effects of thermal stresses.

Brief Sketches of Welding Jobs

Sealed Transformers

Some distribution transformers are now being built hermetically sealed with covers welded on. The latest step taken in transformer manufacture not only indicates that trouble now rarely occurs to the "innards" of a transformer, but also it, in itself, removes the last remaining cause for periodic attention.

By sealing the transformer, air and moisture can no longer reach the oil, thus eliminating sludging, acid formation, and lowered dielectric strength. All breathing is now prevented, there being no gasketed joints—even around the bushings. These, incidentally, were the last obstacles to the complete sealing of the transformer. By making use of the technique by which porcelain-to-metal connections are made, this problem was solved. Although it is not anticipated that the case of these transformers will require opening, provision is made for cutting off the top with a torch, and subsequent rewelding. The



Westinghouse Photo

This transformer is as air tight as a tin can with its cover welded on.

small amount of air trapped inside during original manufacture or a single opening in service does not contain enough oxygen to cause any oil deterioration.

» «

All Welded Bench

By C. C. Lynde

The sturdy workbench is an essential item on construction jobs yet, because of the nature of the work it is frequently difficult to obtain a bench that is sufficiently strong to handle heavy equipment yet light enough to be portable as is required by the work involved. An oil company weldor, however, has solved this problem by building a bench of welded construction which possesses the required strength, though lightweight and at the same time provides a secure container for tools when on the move.

The bench is made of a heavy frame of 3 in. pipe with a steel plate welded flush at one end to give a working space

No lost tools is a feature of this all welded work bench.

for bulky repairs. Two-thirds of the top was recessed to the depth of the pipe thickness by welding a plate on the bottom of the upper pipes. This recessed area thus formed a suitable working area for overhauling smaller pieces of equipment and inasmuch as it was a tight pan, prevented the loss of such items as ballbearings, since all of the work was done in a recess. The lid which covers this recess section was provided with pins and wards in which tools may be kept. When the bench was moved, the lid which covered the recess section was fastened in place with one or more bolts, thus closing the tools in a tamper-proof chest. The bench with its contents of tools, may now be lifted on a truck with a winch line and carried away with other heavy equipment without the danger of damage or possible loss of tools.

» «

Utility Crane

A portable utility crane of welded construction is finding increased popularity in the shops of air transport schools, air schools and colleges. Because of its welded construction, it is sufficiently light in weight to allow it to

A welded crane of this type is highly portable and highly practical.

be moved readily in any direction and thus in effect, becomes a flexible overhead hoist which can be used anywhere at any time. Likewise, the use of welding permits flexibility and design so that the cranes may be made with hinged frames to allow passage through doorways; with telescopic frames for work under and around overhead obstructions or with a revolving base. Likewise, they can be made so as to combine these three features.

The Lewis-Shepard Sales Corp., Watertown, Mass., manufacturers of this equipment, are finding that not only the aircraft industry but many others in the Defense Program or allied with it, are making use of these welded cranes to speed up production, maintenance and repair work.

Water coolers on welded stands last three times as long.

Welded Stand Saves Water Cooler

By C. C. Lynde

The service life of a water cooler in the oilfield is relatively short but one oil drilling contractor has found that it can be increased to upward of three times by the use of welding. It was simply a matter of getting the cooler off the ground floor or improvised stand onto a good permanently constructed welded stand. Such an arrangement made it easier for the men to obtain water and was also much more sanitary in that they now used the spigot instead of dipping their cups into the cooler.

The way this came about was relatively simple. A welder taking three short lengths of 2 in. pipe welded pieces of light plate to one end to form feet while a round plate provided with a flange rim was welded to the other end of the pipes making a flange top to hold the cooler in position. Thus the cooler was provided with a sturdy stand capable of withstanding severe service.

» «

Two things rule the world . . . *Spirit* and the *Sword* . . . but Spirit will be the final victor.—*Napoleon.*

Brief Sketches of Welding Jobs

Fish Oil Plant Moves

Several years ago, some of the deep sea fishermen operating off the California shore, conceived the idea of outfitting ships as factories to manufacture fish oil and fish meal on the high seas. One such factory was the "Manatawny" which carried a complete reducing plant aboard and was served by a flotilla of small fishing boats. In order to insure continuous operation, this ship was equipped with a machine shop with complete oxyacetylene and electric welding equipment.

With the advent of war in Europe and its constant demand for more and more cargo vessels, it was decided to withdraw the "Manatawny" from off-shore fish reduction, removing the plant and reconditioning the ship for sale to a foreign government as a cargo vessel. Then the Deep Sea Fisheries, Inc., decided to utilize the equipment and proceeded to build a shore plant at Benicia, California. Most of the equipment had to be rebuilt to meet the requirements of the new plant and several additions were necessary to provide new facilities for land operation. Important savings were accomplished by the use of gas cutting and arc welding for this reconstruction project.

New bases were required for practically all of the machinery and these were readily fabricated from standard roll shapes by cutting to size and welding at the site. The unloading conveyor as taken from the ship proved to be too short and was lengthened by the simple procedure of cutting the part in the center and welding in a new section.

By means of this conveyor the fish are delivered to the weighing hopper and then dropped into large tanks. These receiving tanks were also welded at the site of the new plant. Screw conveyors carry the fish from the bottom of the tanks into the plant where they are cooked. This mechanism is of very simple but highly efficient design which it would be practically impossible to utilize except by the use of gas cutting and electric welding for the fabrication.

Cooking is done in five large vessels which are completely welded. The cooking medium is steam circulating in gas welded one inch pipe coils on the inside. On being reduced, the oil is pressed out of the mass and is stored in tanks of approximately 20,000 gallon capacity. The residue is ground and packed in bags. It is high in food value and is sold for feed of animals and poultry.

Four additional tanks (8,500 gallon capacity) were built for the job at a substantial saving. Bids had been received at $350 each for tanks of 14 gauge steel. The company, however, was able to build them of 12 gauge steel with ½ in. bottoms and 14 gauge tops for $235 each for a total saving of $460.

Additional equipment, which is planned in order to bring this plant up to desired capacity, includes a medium high pressure piping system which will be built to insurance inspection requirements.

These four tanks were constructed of heavier material for less money than was possible by other joining methods.

The welding job has been completed so now the building can be built to complete the job.

Photos Wilson Welder and Metals Co., Inc.

A welded harness makes the handling of barrels easier.

Barrel Dumping Harness

The use of welding makes the dumping of a barrel or drum a lot easier now. By means of a simple welded structure built of shapes and bars, the Lewis-Shepard Sales Corp., Watertown, Mass., have developed a quick locking harness to speed up and make more efficient, the handling and dumping of containers of this type. The harness which is equipped with a spring toggle, is arc welded throughout and can be made to fit any size drum.

In operation the barrel is merely set in the harness, the toggle flip catching the top of the barrel and the entire unit is carried by a crane or other overhead unit, which supports the drums by the trunuions on the harness since the barrel is now in perfect balance, it takes very little effort to tip it or the drum as desired.

» «

This welded bridge speeds defense production.

All Welded Bridge

When increased defense program activities recently required an expansion of a division of the Harnischfeger Corp., Milwaukee, into an adjoining building, welding came to the rescue in a rather unusual manner. Since conveyance of material to and from the buildings on ground level would tie up an important plant thoroughfare, an overhead bridge was designed.

All welded in construction, its erection progressed rapidly. Completed, it has a concrete floor and is fully enclosed, with large window areas providing ample daylighting. To speed the construction operation it was found advantageous to use portable engine driven welders.

New Product Developments

Continuous operation at maximum amperage is claimed for this welder.

A-C Welder

★ The new line of transformer type of **A-C Welders** introduced by the **Larkin Lectro Products Corp.**, 220 Taaffe Place, Brooklyn, N. Y., have many desirable features.

Model 75G, is a 75 amp. Welder, manufactured to meet the needs of the small shop and outside welder, where only 110 v. 60 cycle current, and 30 amp. fuses are available. **Models—150G and 250G**—are 150 and 250 amp. welders, respectively. Built to conform with N.E.M.A. specifications, they are claimed to be capable of operating continuously at maximum amperage. These machines operate on 220 v. 60 Cycle, alternating current. They feature three open circuits, the operator may use open circuit of 65 or 85 v., up to 150 amp. and 48 v. from 150 to 250 amp. All models have Amperage Glide Control, making available to the operator continuous amperage output.

» «

Machine Cutting Tips

★ The **Airco "45" High Speed Machine Cutting Tip** which features a nozzle with a divergent exit portion, has been announced by **Air Reduction Sales Co.**, 60 E. 42nd St., New York.

It is claimed that this new tip, inasmuch as its design makes it possible to eject a narrow high velocity stream of oxygen, practically free from exit turbulence, makes it possible to increase cutting speed of a machine torch from 20 to 30% and assures cuts of quality comparable to those obtained with standard tips. It is said that this is made possible through the fact that a narrower kerf is burned with a divergent tip than with the conventional cutting tip. As a result of burning away less width of metal in a cut the speed is increased with no increase in oxygen consumption.

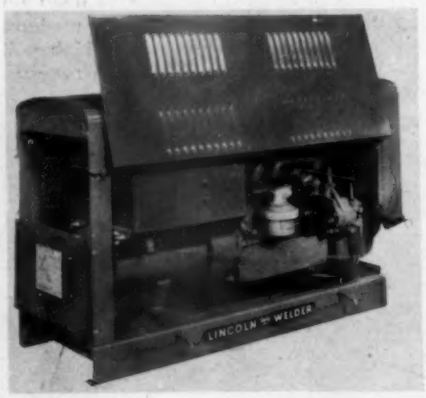
Airco "45" High Speed Machine Cutting Tips are available in sizes 0, 1, 2, 3, 4, 6, 8 and 10 for cutting metals up to 8 in. thickness. The tips will fit standard machine cutting torches.

» «

Crater-Eliminator

★ The **Allis-Chalmers Mfg. Co.**, Milwaukee, announce a new **Crater-Eliminator** for use on Weld-O-Tron Low Current Arc Welders. This eliminator is manufactured in two types, Type A is a portable unit in which the motor and rheostat are mounted in a small convenient unit which may be carried about readily and located in a spot near the weldor. The Type B Crater-Eliminator is mounted with its motor on the back panel of a Weld-O-Tron and is connected directly to the Weld-O-Tron rheostat by means of a shaft. Either of these eliminators are suitable for the 40 or 75 amp. Weld-O-Tron and operate on 110 or 120 V., 50 or 60 cycle current, depending upon the individual needs.

» «



Engine-driven arc welder especially designed for job welding.

Arc Welder

★ A new engine driven arc welder which is specially designed for job welding and garage work and which embodies a new system of engine-speed control is announced by The **Lincoln Electric Co.**, Cleveland. A D-C unit with a current range of 40 to 250 amperes, the machine is said to be suitable for all types of work. Its compactness and light weight is said to make it readily portable and hence suitable for work in remote locations as well as those applications which are readily accessible.

The machine's self-indicating voltage control ("job selector") and current control is claimed to make it easy for the operator to select any type of arc and any arc intensity to suit the job and to provide continuous selection throughout the range. The generator is single-operator, variable-voltage type with laminated pole pieces and is said to generate its rated current of 200 amp. at 1400 rpm. The unit is equipped with exclusive "dual continuous control," enabling variation of both open circuit voltage and welding current, independently.

The welder is powered by a Hercules industrial engine equipped with centrifugal type governor, high tension magneto with impulse starter coupling and oil bath aircleaner.

» «

Welding Electrodes

★ The **Anthony Carlin Co.**, 2717 East 75th St., Cleveland, manufacturers of rivets for over thirty years, are now offering a complete line of **"Perfection" Arc Welding Electrodes.**

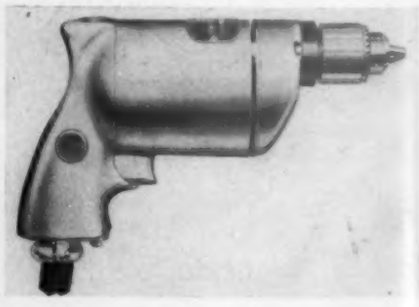
"Perfection" arc welding electrodes are manufactured to strict specifications, based upon scientific development by men having a thorough knowledge of metallurgical engineering, chemistry, ceramics, and circuit characteristics. This fact enables them to offer to the trade a complete line of welding electrodes, which it is claimed are guaranteed to conform in every respect to the requirements of recognized inspection agencies.

» «

Electric Drills

★ **Black & Decker**, Towson, Md., announce 4 new models of a **Heavy Duty Holgun**—said to be especially engineered to the heavy production requirements adapt it to a wide variety of ¼-inch drilling operations.

These units are said have all the popular Holgun features — plus 50% more power than the standard Holgun. The standard speed end handle model weighs only 60 oz., is only 7¾ in. long. All units have 2-pole instant-release switches, with the Black & Decker "Pistol Grip and Trigger Switch" control, suited to either right or left hand operation. Powered by Black & Decker-built universal motors and ball-bearing equipped throughout.



For heavy duty yet light weight.

There's the STAINLESS STEEL WELDING ELECTRODE YOU WANT"

● It's listed on page 6 of this booklet on Stainless Steel Welding and Electrodes that has been prepared by PAGE.

●

You probably know as well as we do that you must look for and insist on getting two distinctly different *kinds* of quality in your Stainless Steel Electrodes.

It is imperative for good Stainless Steel Welding that the deposit *in the weld* be equal to the Stainless Steel you are welding.

It is just as important that the electrode be of the shield-arc type, to protect the metal in the weld; equally usable in horizontal, vertical and overhead positions; permit high speed welding with minimum spatter and slag loss and smooth beads.

To get all those qualities for you, PAGE worked in the field and laboratory with the world's largest producers of Stainless Steel —until they said every PAGE Stainless Electrode was *right*.

Start right, then, with your Stainless welding. Depend on PAGE. Tell your local PAGE Distributor the Stainless Steel you want to weld and accept his recommendation.

Be sure to ask your local PAGE Distributor for a copy of this valuable, well illustrated booklet on the welding of Stainless Steels. It covers the entire subject.

PAGE WELDING ELECTRODES

PAGE STEEL AND WIRE DIVISION • MONESSEN, PENNSYLVANIA

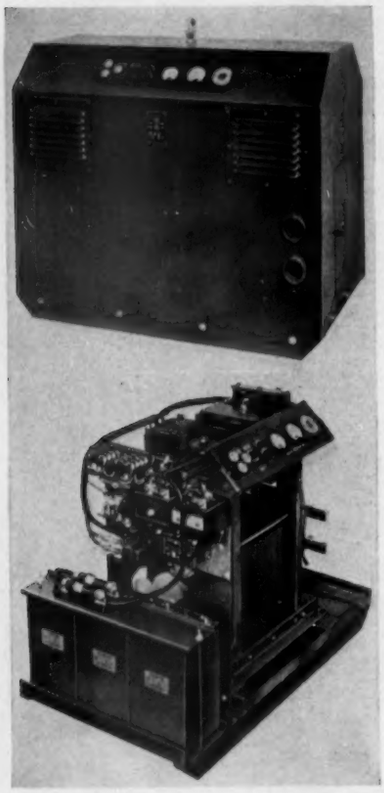
AMERICAN CHAIN & CABLE COMPANY, Inc. BRIDGEPORT, CONNECTICUT

New Product Developments

A-C Welder

★ **Model 55-S** is a new A-C transformer type welder which has been announced by the Glenn-Roberts Co., 1009 Fruitvale Ave., Oakland, Cal. This welder, which is said to be designed so as to supply a stable arc current under continuous control for Unionmelt and other automatic head welding, has a rated output range of 400 to 800 amps. with a maximum output of 1100 amps. It operates on 220-440 v., 60 cycle single phase A-C current.

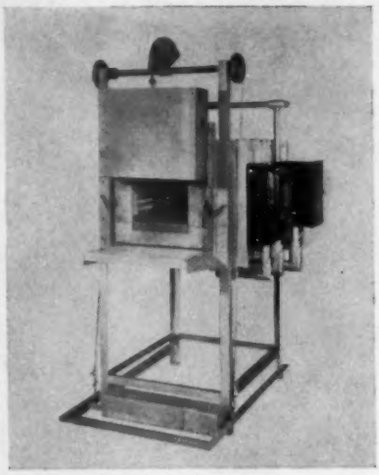
The features claimed for this new unit are high power efficiency, simplicity, rugged construction, and compactness of design for best utilization of floor space. Installation and operation has been facilitated by including built-in



(Top) The maximum output of this welder is 1100 amps. (Lower) It is a compact unit as this interior view reveals.

primary contactors and output current regulation completely wired so that the control cables leading to the control switches at the welding head or station may simply be plugged in. An auxiliary 2 kw. transformer provides 110 V. power to operate control relays.

Model 55-S is designed with an all welded frame and through removable end panels it is possible to gain easy access to all control relays and wire. It is air cooled and capacitor type power factor correctors are available and are designed to mount inside the transformer case for compactness and protection.



Hardening and tempering are two of the many uses of this furnace.

Electric Furnace

★ **H. O. Swoboda, Inc.,** 202 13th St., New Brighton, Pa., announces production of a new line of **"Falcon"** Electric Box Type and Muffle Type furnaces. These furnaces may be used for testing of metal samples, melting of glass samples, burning of refractories, oxidation determinations, testing of vitreous enamels, heating of high speed and similar steels in tool rooms, for hardening and tempering, and many other widely varying applications.

"Falcon" Electric Box Type and Muffle Type furnaces are arranged for either floor or bench mounting and are equipped with heavy alloy heating elements to assure efficient, long-life operation at temperatures up to 2300 F. Heating elements are supported in high grade refractories arranged in top, bottom, side and rear walls of the furnace. Furnace chamber is completely surrounded by durable block type insulation.

» «

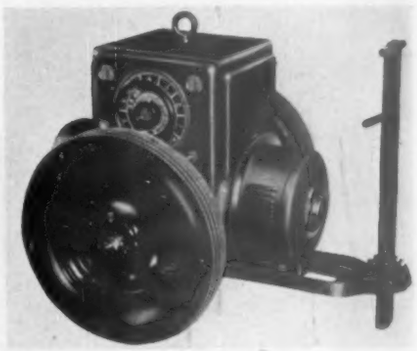
Electrode Holder

★ **The Hol-Tite Corp.,** Herrin, Ill., announce a new line of electrode holders for 300, 400, or 500 amp. welding service. One of the features claimed for this streamlined type holder is the positive vice-grip on the electrode. It is said that the inserting of the electrode is simply a matter of giving the holder a slight twist yet the electrode is always held tightly and permanently in the desired position. Low maintenance costs is another claim for the holder in that the jaws are readily replaceable and that the holder is without springs.

No springs to hold the electrode yet positive grip is assured.

Welder Trailer

★ **Hobart Bros. Co.,** Troy, Ohio, announce a new two wheeled, lightweight, pneumatic tire-equipped trailer of all welded construction for transporting 200, 300, or 400 amp. Hobart electric welders. The trailer is so designed that the mounting of the welder is accomplished easily by means of 3 bolts in the frame of the trailer which register with bolt holes in the legs of the welding machine. By virtue of its low, underslung construction, narrow tread and precision method of balancing, the unit may be easily moved by hand, yet at the same time it is designed for road towing up to 35 mph. A combination tow bar and standing support has a hand-operated ratchet for locking the support arm into position.



Easily handled by hand or by truck at speeds to 35 mph.

» «

Brazing Rod

★ **Macoloy Type "F"** phosphide alloy brazing rod is a new patented, general purpose low temperature non-ferrous brazing rod for corrosion resistant coatings and the brazing of copper, brass, ferrous metals, and stainless steel alloys which has been announced by the **McCauley Alloy Co.,** 123 W. Madison St., Chicago. It is said to be resistant to solutions of sulphuric, hydrochloric and many other acids.

Macaloy Type F is said to have a melting point of 1180 F and is available in ¼, 3/16, 5/32 and ⅛ in. rods and also in wire sizes suitable for metal spraying. It is claimed that if the brazing is done at the proper temperature, this material will flow in a thin layer and spread over the heated area.

Castings of the same material and known as Maco phosphide alloy castings are also available from the same company.

» «

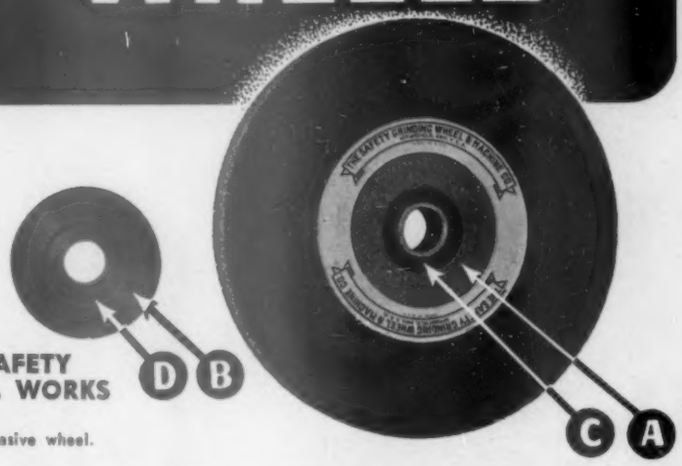
BONDS MEAN BULLETS
Get Your
U. S. DEFENSE BONDS
AND STAMPS TODAY

NEW "SAFETY" DEVELOPMENT FOR PORTABLE GRINDERS . . .

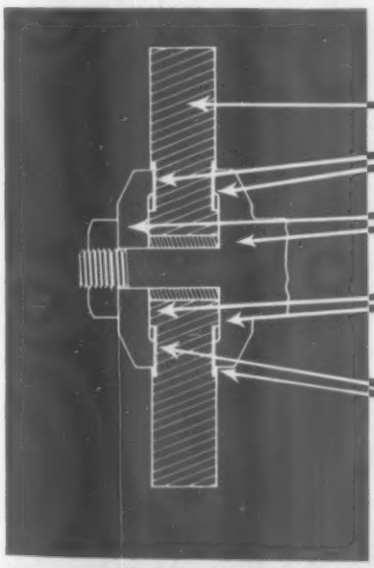
"SAFETY" GRIP-LOK GRINDING WHEELS

Grinding wheel failures are most generally caused by one of the following: 1—Injury during shipment, 2—Incorrect mounting of the wheel, 3—Accidental injury during operation.

Insure against injuries, property damage and costly time delays by insisting on the portable grinding wheel which prevents a broken wheel from flying apart . . . the new SAFETY GRIP-LOK GRINDING WHEEL.



. . . HOW SAFETY GRIP-LOK WHEEL WORKS



1. Represents the abrasive wheel.
2. Safety Grip-Lok Wheel has annular recesses on both sides concentric with arbor hole.
3. Standard flange same as provided on all portable grinders.
4. Relief in flanges. When wheel is mounted and tightened flanges 3 enter recesses 2 and overhang ends of abrasive hub.
5. Resilient composition washer is located in recess 2 on both sides of wheel. When pressure is brought on washer, flanges 3 enter recesses 2 by compressing the washers.

When the flanges ("B" in photograph of collar above) compress the composition rubber and cork washer in the recess ("A" in photograph of wheel above) they allow the raised hub, "C", to come up under the recess of the flanges, "D", and act to prevent segments of a broken wheel from flying outwardly.

We can promptly supply "SAFETY" GRIP-LOK WHEELS in all grains and grades. For the phone number of the "Safety" Sales Office or Warehouse nearest you, consult the list below.

"REMEMBER PEARL HARBOR"

SAFETY

Established 1891

THE SAFETY GRINDING WHEEL & MACHINE CO.

Main Office and Factory SPRINGFIELD, OHIO, Phone 4651

• SALES OFFICE ★ SALES OFFICE and WAREHOUSE

• Birmingham—3-3323 ★ Chicago—Brunswick 2000 ★ Cleveland—Cedar 9292 ★ Detroit—Trinity 1-5420
★ Erie—25-687 • Houston—Preston 2381 ★ Philadelphia—Rittenhouse 6095 ★ Pittsburgh—Court 2822
• St. Paul—Nestor 7279 ★ St. Louis—Central 3787 ★ Syracuse—2-1377

Near perfect amperage control is claimed for this welder.

A-C Welder

★ The **Dialarc A-C Welder** is just being presented nationwide by its manufacturers, the **Shober Sales, Inc.,** Stockton, Cal.

The Dialarc Welder is claimed to be the first to offer near perfect amperage control. Its flexible design is said to make it possible to build Dialarc Welders with heats as low as one amp. or as high as 2000 amps. which permits its use in almost any of the varied and complicated problems of National Defense fabrication.

One of the outstanding features is the elimination of the "tap out" method of current selection in steps of 10 to 25 amps. and the dead spots they create. With the Dialarc, any heat can be selected by the mere turn of a dial. Arc quality is claimed to be one of the prime design objectives of the Dialarc, the attainment of which resulted in the development of a Variable Reactor, a patented feature said to give highly efficient stepless control.

The Dialarc, which has been tested and approved by the Underwriters' Laboratory, is covered by a 5 year service guarantee by the manufacturer, as well as the regular insurance policy. It is offered in two models. The heat range of Model K200 is 15 to 230 amps. and Model K300 from 15 to 360 amps. The open circuit voltage (80 volts) is claimed to be constant from the lowest to the highest heats, thus assuring excellent arc striking quality throughout the entire welding range. The unit is enclosed in a cabinet constructed of angle iron frames and non-magnetic asbestos cement panels.

» «

Testing Machine

★ **W. C. Dillon & Co.,** 5410 W. Harrison St., Chicago, announce a new line of low capacity tensile testing machines. These machines have a varying capacity ranging from 0 to 50, to 0 to 1000 lbs. They may be obtained in a straight compression type or expansion type or a combination of both. Any model may be motorized if desired. The machines are so constructed that numerous types of interchangeable jaws may be utilized. Special jaws for gripping specimens may be obtained to order. The machine is designed so that the maximum hand on the dial indicator remains at the breaking point of the specimen with reset.

» «

Grinding Wheel

★ **A. P. deSanno & Son, Inc.,** Phoenixville, Pa. is introducing a new Radiac product—Por-os-way. **Por-os-way** is a new type precision grinding wheel—produced by a new patented process. It is said that Por-os-way, properly used takes deeper cuts, grinding through .010" or more. The structure, instead of being "sandy" and compact is claimed to be "stringy" and porous—resembling a sponge. Air cells allow the air to keep every grinding contact cool, yet it is claimed Por-os-way is hard, tough, holds the corner and requires little dressing—due to a new vitrified bond.

Por-os-way grinds hard alloys, copper, aluminum, wood, rubber, plastics and other soft materials with minimum loading.

» «

Huge vacuum disc hold plates in alignment.

Vacuum Clamp

★ **Vac-U-Clamp** is the name given a new vacuum type clamp that has been perfected by **Glenn-Roberts Co.,** Oakland, Cal.

This new device is designed to clamp stiffeners or other items tightly to plates so that close fitups are obtained during welding. It consists of two rubber gasketed disc "feet" 18 in. in dia. which are held in place by vacuum maintained in a storage tank by motor driven vacuum pump. This pump removes the air under the disc thus producing a powerful grip on the plate. A center screw shaft provides a means for holding the stiffener beam and a hand crank makes it possible to force the stiffener tightly against the plate. The vacuum may be released by means of two way valve. The unit weighs 135 lbs. and is operated on either 110 or 220 v., 60 cycle A-C current. It is adjustable to accommodate all sizes and spacings of stiffener beams.

» «

An effective cover for protecting workers.

Rheostat Cages

★ A variety of **Rheostat Cages** have been developed by the Ohmite Manufacturing Co. for use with Ohmite Rheostats. A cage enclosure is a convenient form of table top or surface mounting and is advisable where there is possibility of mechanical injury to the rheostat or human contact with electrically "Live" parts. Surface mounting cages are widely used in connection with fractional h.p. motor controls; heating device controls; on dental and medical equipment; and for use in laboratories.

Ventilated cages with perforated sides are most generally applicable. Other types available are: dustproof cages, cages to house rheostats in tandem, explosion proof cages, ventilated cages with one-half closed as a splash guard, and a laboratory type semi-enclosed table-top cage. Various types of terminals can be supplied.

For details write to **Ohmite Manufacturing Co.,** 4835 Flournoy St., Dept. 3C, Chicago, Ill.

» «

Protective Lighting

★ **The Goodrich Electric Co.,** 4600 Belle Plaine Ave., Chicago, announce a new **Elipso Standlite** designed for protective illumination around industrial plants, conforming with FBI specifications. The elliptical shape of this reflector provides for wide lateral distribution of light with a low mounting height, lamps of 300 to 500 watts deliver a high intensity of illumination.

The Elipso Standlite is available in the two styles shown above. While the Direct Style delivers light laterally, the Angle Style provides a slight forward throw. Finished in permanent porcelain enamel, entirely weatherproof, and are for mounting on a standard two-in. pipe.

GET THE MOST
OUT OF YOUR
WELDING CABLE DOLLAR

"MAJOR" Welding Cable sells so fast because it combines low cost with highest quality and dependability — which means that you get the most welding cable service out of every dollar spent for welding cable.

5,000,000 Feet Already Sold — It MUST Be Good!

"MAJOR" RUBBER COVERED, SUPER FLEXIBLE, SINGLE CONDUCTOR, ELECTRIC ARC WELDING CABLE is manufactured and guaranteed by a million dollar concern. It is used regularly and extensively in industry after industry all over the country. The U. S. Navy has purchased over 250,000 feet—a single independent shipyard bought 135,000 feet.

WHATEVER YOUR WELDING CABLE NEEDS - SPECIFY "*MAJOR*"

SPECIFICATIONS

Size	Amps.	Strands	O.D.	I.D.	Wt. in lbs. per M ft.
6	75	950	.400	.210	132
4	125	1029	.495	.275	202
3	150	1323	.500	.305	235
2	200	1666	.560	.335	295
1	250	2156	.625	.400	373
1/0	300	2646	.675	.440	450
2/0	375	3381	.750	.490	570
3/0	450	4284	.815	.545	705
4/0	550	5376	.900	.635	860

Copper conductor consists of fine bare wires, properly stranded to give extreme flexibility.

A separator is applied over the conductor to strip rubber in order to leave bare copper for quick, clean attaching to lugs for electrode holders.

Rubber jacket has high tensile strength, maximum abrasion resistance. It is tough, durable, waterproof and extremely flexible.

Check These Other "SAFE-WELD" Products! Get Service - and Save $ $ $

✓TUFCORD 2 and 3-conductor Power Cable ✓BULLDOG Clamp Type Electrode Holders
✓ LIBERTY Helmets ✓ TWIN-WELD Gas Hose ✓ MONARCH Navy Lens

If your dealer cannot supply your needs write us direct for quotations

WELDING ENGINEERING COMPANY
MILWAUKEE, WISCONSIN
MANUFACTURERS—DISTRIBUTORS
OFFICES AND AGENTS ALL OVER THE UNITED STATES

Brief Sketches of Welding Jobs

Harnischfeger Corp. Photo

Resurfacing peels increases life.

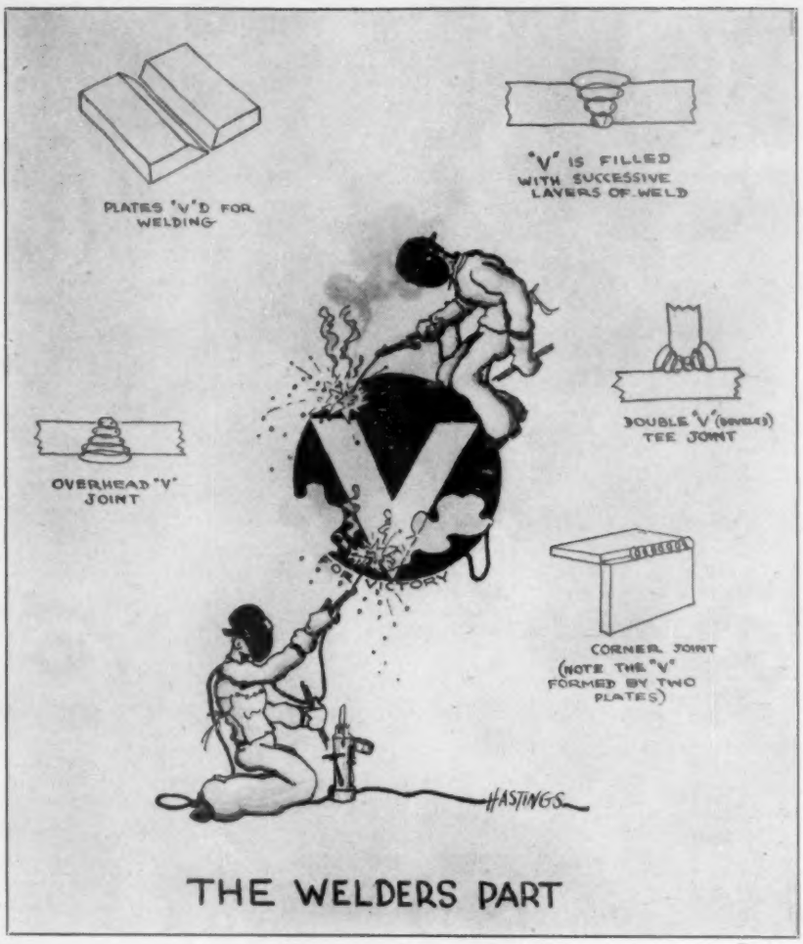
Peel Resurfacing

By H. W. TYMICK

Resurfacing and maintenance of peels, the device used for charging steel scrap into open hearth furnaces, can be an almost endless job at terrific cost. Working in temperatures around 3000 F., lifting and rotating pans of scrap steel with total loads up to 5,500 lbs., peels are subjected to extremely heavy abrasion. Wear is speeded by operating temperatures reaching up to 1400 F.

In recent open hearth service, it was found that peels resurfaced with a special-purpose electrode of medium high-carbon steel gave from 4 to 8 times longer service. Where this maintenance operation had to be performed once or twice a week, the use of an electrode producing a machinable deposit having superior resistance to abrasion at high temperatures cut it down to about only once a month.

These findings typify the many new opportunities for improved welding results made possible by the rapid advancement in electrode manufacture.


PLATES 'V'D FOR WELDING
"V" IS FILLED WITH SUCCESSIVE LAYERS OF WELD
OVERHEAD "V" JOINT
DOUBLE 'V' (SINGLE) TEE JOINT
CORNER JOINT (NOTE THE "V" FORMED BY TWO PLATES)
FOR VICTORY
HASTINGS
THE WELDERS PART

Courtesy Lincoln Electric Co.

Here's how Welder Bob Hastings, Newport News, Va., sees welding and "V" welds as the "V for Victory" symbol in the war with the Axis.

News of the Industry

Welding Confab

According to "Heinie" Schneiderwind, President, the **Omaha Welding Co.** will hold their 8th Annual Welding Confab, March 3, 4, 5, and 6 at the company's plant, 1501 Jackson St., Omaha, Neb. From all indications it is expected that this Confab will surpass its seven predecessors in every respect and that again a new attendance record will be established.

In cooperation with various manufacturers of welding equipment and accessories, there will be demonstrations of gas welding, electric welding, hard-surfacing, oil-field welding, and white metal welding, as well as discussions relating to welding problems and National Defense.

The Castle Hotel will be the official stopping place for the out-of-town visitors attending the Confab.

» «

Tool Engineers Meet

The 10th Annual Convention of the **American Society of Tool Engineers** which is expected to draw many of this organization's 10,000 members, will be held in St. Louis March 26th to 28th.

» «

H. C. Price Co., Bartlesville, has been awarded contracts for electric welding of the following pipe lines:

For **Phillips Petroleum Co.**—72 Miles of 8-in. from Paola, Kan. to East St. Louis, Mo.—General Contractor O. E. Dempsey Construction Co.

For **Stanolind Pipe Line Co.**—17 Miles of 8-in. near Carrollton, Mo.—General Contractor Oil States Construction Co. —Contract Completed.

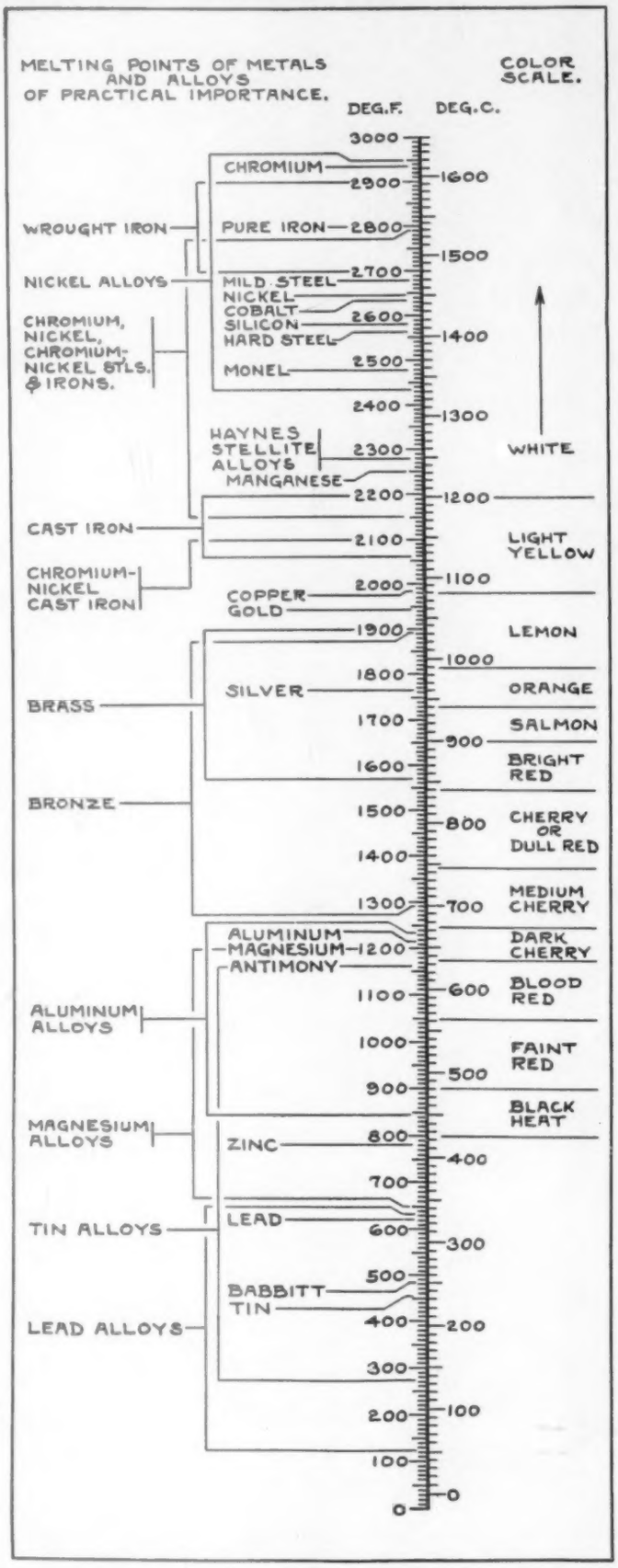
For **Stanolind Pipe Line Co.**—28 Miles of 12-in. near St. Marys, Kan.—General Contractor O. E. Dempsey Construction Co.—Contract Completed.

For **Panhandle Eastern Pipe Line Co.** —154 Miles of 12-in., 16-in., 18-in. and 20-in. in the State of Michigan—General Contractor I. C. Little.

For **Illinois Pipe Line Co.**—8 Miles of 8-in. from Lancaster to Parkersburg, Ill.—General Contractor Sheehan Pipe Line Construction Co.—Contract Completed.

For **Phillips Petroleum Co.**—50 Miles of 8-in. from Paola, Kan. to Kansas

Temperature Data*



This Useful Chart Includes Melting Points And Other Temperature Data

THE accompanying chart not only lists the melting points of various alloys and metals but also serves as a convenient means for conversion between Centigrade and Fahrenheit temperature scales. In addition, on the far right of the scale are shown the color designations that are commonly used in judging the temperatures of hot metal by color.

Melting Points

This chart should prove useful to all welding operators for it contains basic information on working with metals at elevated temperatures. Reference to the chart, for instance, shows why aluminum and aluminum alloys, because of their low melting points, give little or no indication by change in color when they approach welding heat. On the other hand, the high melting point of wrought iron explains why considerably more heat is required to weld this metal than is required for cast iron, for instance.

Temperature Color Scale

Another use for the chart is in estimating the temperature by color. For instance, instructions may require that the part be preheated to 1,100 deg. F. before welding. If you are without a thermocouple or other means for accurately measuring high temperatures, reference to the chart shows that the part, at 1,100 deg. F. would have a blood-red color. With a little experience, you can estimate this fairly closely by eye. In this connection, it should be mentioned that the color scale is for observations made in a fairly dark place and without welding goggles. As the light increases, the color groups on the scale will apply to higher temperatures.

Conversion Data

Finally, the chart is a ready means for converting Fahrenheit to Centigrade, and vice versa. Suppose you are familiar with the Fahrenheit scale, yet instructions call for the quenching of a welded part from 900 deg. C. Reference to the chart shows this to be approximately 1,650 deg. F.

---

*Reprinted from *Oxy-Acetylene Tips*, February, 1942

"Ships from Denver!" says OPM
Thanks to Prefabrication . . .

Keep Pace with Tomorrow by Joining Today—
THE AMERICAN WELDING SOCIETY

It's no news now. It wasn't news months ago . . . to members of The American Welding Society . . . that 12 Denver steel-working firms had been selected to fabricate the hulls of 24 big, fast escort vessels for the U. S. Navy.

Building ships like prefabricated houses isn't a new idea to welders, anyhow . . . but perhaps it is a bit different to fabricate American hulls in the high-and-dry Rockies and then ship them to the Pacific Coast for final assembly.

New and different ideas, however, are "stock-items" in The American Welding Society. Its members . . . including engineers, executives, purchasing agents, foremen, welders, designers and draftsmen, professors and students, research workers, inspectors . . . are on the alert for anything to help them win the war. They cooperate with each other wholeheartedly . . . through the Society, its meetings, publications and research program.

Here's what the Society and its 4800 members offer you in 1942:

1. **An opportunity to meet and talk with leaders of the welding industry at monthly Section meetings, at the annual Welding Exposition, and at other regional and national meetings.**
2. **A key to new ideas and the latest progress in the art. Code service for Sustaining Members, with up-to-date bulletins.**
3. **A chance to take an active part in developing better welding techniques and new applications. Research conducted under the auspices of the Welding Research Committee.**
4. **Membership Certificate; Membership Emblem (available at nominal cost).**
5. ***Year Book* telling "who's who" in welding, including all Members and Sustaining Members.**

COST: Sustaining Membership, $100; Membership, $15; Associate Membership, $10; Operating Membership, $5; Student Membership, $2.50 a year.

The American Welding Society provides you who are interested in welding with a growing fund of data and ideas . . . any one of which may be worth many times the cost of many years' membership to you. Please write me for a free copy of our informative booklet on the Society.

J. D. TEBBEN, Chairman Membership Committee
THE AMERICAN WELDING SOCIETY
33 West Thirty-Ninth Street
New York, N. Y.

City, Kan.—General Contractor O. E. Dempsey Construction Co.

For **Panhandle Eastern Pipe Line Co.**—4 Miles of 12-in. River Crossings near Louisiana, Mo. and Montezuma, Ill.—General Contractor J. J. Connor Construction Co.

Trade News

Since its inception fifteen years ago, expansion has been the oft recurring practice of **Macklin Co.**, Jackson, Mich., manufacturers of grinding wheels.

Keenly alive to the nation's production needs and wishing to be prepared for anticipated demands upon its capacity to produce, Macklin, several months ago, started another important addition to its plant — a building to house a new continuous kiln which will increase the production of vitrified wheels by 30%. Recent additions make Macklin one of the nation's most modern plants now busily engaged in supplying grinding wheels to meet the nation's productive needs.

» «

The **McCauley Alloy Co.**, 123 W. Madison St., Chicago, is a newcomer in the welding field. This organization will specialize in the manufacture of corrosion abrasion resistant alloys and welding rods. Their development division is located at 1312 Franklin Ave., Chicago Heights, Ill.

» «

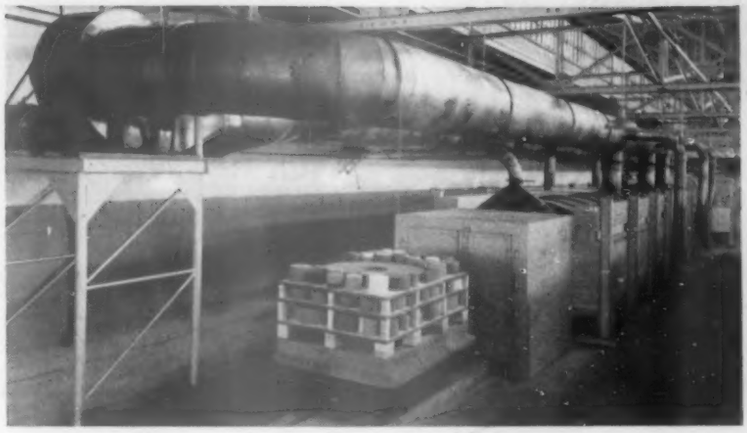
Welding Equipment & Supply Co., Detroit, announce that **Antrim & Co.**, 1555 Taylor Ave., N. W., Grand Rapids, Mich., have been appointed distributors of the Eureka line of tool steel and alloy welding rods for the entire state of Michigan.

» «

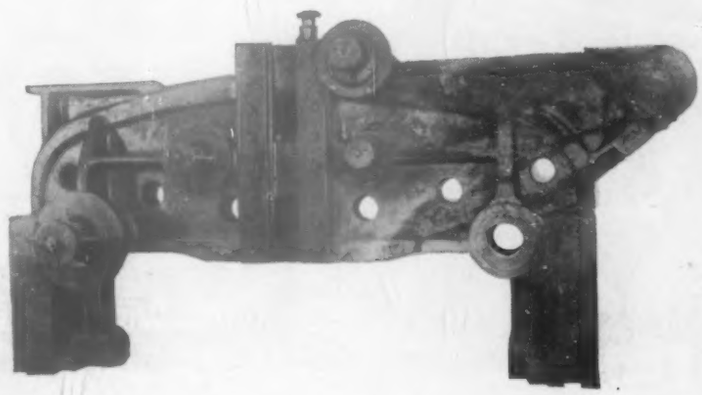
The **Acme Electric Welder Co.** announce the removal of their plant to new and larger quarters at 2618 Fruitland Rd., Los Angeles. The new plant which is of modern steel and brick construction, has a floor space of 18,000 sq. ft.

Personals

J. C. (Jim) Gowing, Southern California distributor for Hobart Bros. and the Motor Generator Corp., announces the removal of his office to new and larger quarters at 1007 Santa Fe Ave., Los Angeles. In addition to the Hobart line, Mr. Gowing has added a low temperature brazing alloy line representing the Eutectic Welding Alloys, Inc., in the Southern California area.



New Kilns at the Macklin Co.'s Plant.



BACK IN ACTION . . . TRIPLE ACTION . . .

because of speedy, reliable Tobin Bronze Welding

INCALCULABLE sums are saved for industry every year in both equipment and time by repair welding with Tobin Bronze—the original low melting-point (1625°F) bronze welding rod.

Take, for example, this badly fractured 15-ton triple action press crown that was disabled when a break occurred in the two webs above the right hand cross shaft bearing. This production giant was needed vitally . . . and it was back on the job in a week—thanks to the Super Arc Welding Company of Detroit and 1150 lbs. of Tobin Bronze.

A feature of this repair was the fact that the completed weld required no machining. After tack welding, bearings were checked for alignment . . . and constant checking was maintained during the entire welding operation.

For information on welding with Tobin Bronze* and other Anaconda Rods, ask us to send our Publication B-13. You'll find its data doubly useful at this time when speed is the watchword. 4194B

*Tobin Bronze is a trade-mark of the American Brass Company registered in the U.S. Patent Office.

ANACONDA *Anaconda Welding Rods*

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

Subsidiary of Anaconda Copper Mining Co. • In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

R. F. Flood, service engineer in the central division office, Linde Air Products Co., Chicago, has been transferred to Detroit where he will assume the position as assistant district manager of the Detroit office.

» «

Joseph W. Jennings, service engineer with the Linde Air Products Co. in the Milwaukee district office, has assumed the same position in the Cleveland district office.

» «

George H. Woodard has been appointed manager of the new products division of the Westinghouse Electric and Manufacturing Co., F. D. Newbury, vice-president, announced. Mr. Woodard joined the Company when the new products division was created in 1936 for the development of products which have not reached the state of commercial apparatus. After filling the position of new products engineer at the Westinghouse South Philadelphia works for two years, he was brought to the division's headquarters at East Pittsburgh in 1938.

Besides directing development of new products, Mr. Woodard will continue as executive assistant in the Company's emergency products division, responsible for the negotation of government contracts for ordnance material.

• Skilsaw Zephyrplane Belt Sander swiftly removes scale and grit from flat surfaces.
Whatever the surfacing job... whatever the surface, there's a
SKILSAW SANDER
to do Better Work...Faster!
• Skilsaw Disc Sander grinds down raised welds faster, smoother. Sands, polishes.
Put a SKILSAW SANDER on any job you have and see how its extra power brings extra speed to every operation . . . from coarsest grinding to finest polishing . . . on metal, wood and compositions. 6 SKILSAW DISC SANDER Models for sanding, cleaning, grinding on flat, concave or convex surfaces. 4 SKILSAW BELT SANDER Models for sanding and polishing on flat surfaces . . . 10 times faster than by hand. Ask your distributor for a demonstration.
• Skilsaw Disc Sander quickly smooths down welding beads. Also cleans and buffs.
SKILSAW, INC.
4763 Winnemac Avenue, Chicago
New York, Boston, Buffalo, Philadelphia, Cleveland, Detroit, Indianapolis, St. Louis, Kansas City, Atlanta, New Orleans, Dallas, Los Angeles, Oakland, Seattle, Toronto, Canada
SKILSAW
PORTABLE ELECTRIC TOOLS
★ FOR THE DEFENSE OF AMERICA ★

F. J. Carr has been elected vice-president, finance, of American Steel & Wire Co., subsidiary of U. S. Steel Corpn. At the same time, **C. S. Morris** is appointed supervisor of accounting and **Ogden Ashley** is made assistant to vice-president, finance.

Mr. Carr's association with American Steel & Wire began in March, 1938, when he was appointed to the post of assistant to the president. The following October he was named comptroller of the company.

Mr. Morris has been associated with the Wire Company since October, 1907, when he began as a typist in the Invoice Department. He worked his way up through the ranks until being made assistant auditor in July, 1936. In July, 1941, he was named supervisor, general accounting. In his new post he now has charge of sales accounting and works accounting, in addition to general accounting.

Mr. Ashley started with the company in May, 1941, as assistant to the comptroller, which post he has held to the present time.

» «

T. D. Hudson, formerly purchasing agent and assistant auditor of the Pittsburgh-Conneaut Dock Co., Conneaut, Ohio, joined the purchasing staff of the **American Steel & Wire Co.** the first of February as assistant to **Frank E. Chesney,** purchasing agent.

Born in Pittsburgh, Pa., Mr. Hudson began working for the Pittsburgh-Conneaut Dock Co. in that city 26 years ago and after being transferred to Conneaut became a director of both that company and the Pennsylvania-Lake Erie Dock Co.

» «

Ampco Metal, Inc., Milwaukee, Wis., announces the appointment of **J. P. Henry** as its New England representative. Ampco's New England office is located in room 210 Capitol National Bank Building, 410 Asylum St., Hartford, Conn.

» «

F. P. McKegney, formerly Assistant Chief Engineer of the **Air Reduction Co.,** 60 East 42nd St., New York City, has been appointed Chief Engineer, according to an announcement made by Herman Van Fleet, Vice President.

» «

A record believed unique in the annals of industry will be marked February 2nd by The Osborn Manufacturing Co., Cleveland, manufacturers of industrial brushes, moulding machines and conveyor systems. The record to be observed is 50 years of continuous operation under the leadership of **Franklin G. Smith,** whose presidency spans five decades.

When Mr. Smith first became president of the company, Feb. 2, 1892, its staff consisted of one foreman, two men, two girls and three boys. Today, his company's payroll comprises 768 per-

sons. The concern ships its products to virtually all the countries of the world and almost every type of factory uses brushes such as are produced by the organization.

» «

James F. McNamara, New York, mill products sales manager of The International Nickel Co., was elected a member of the board of directors of Lukens Steel Co. at the annual meeting of stockholders, held Jan. 13. It was announced by Robert W. Wolcott, president. Mr. McNamara is also a director of the Harvill Aircraft and Die Casting Co., Los Angeles.

Mr. McNamara joined the International Nickel Co. as a salesman 31 years ago, later becoming vice-president and general manager of the Monel Metal Products Corp. In 1921 Mr. McNamara was made sales manager of all mill products, for the company, in direct charge of finding and expanding new markets and establishing and developing the company's sales agencies.

Elected a director at the same meeting was **Warren H. Snow,** president of E. H. Rollins & Sons Inc., New York.

» «

Edward M. Hicok, for the last three years comptroller of manufacture for the **Western Electric Co.,** has been appointed to the new Company post of personnel relations manager for the Manufacturing Department, effective Feb. 1, 1942. Succeeding Mr. Hicok as comptroller of manufacture is **John M. Stahr,** who has been Works comptroller of the Company's Hawthorne (Chicago, Illinois) plant since 1936.

Current Reviews

Grinding Booklet

"A Primer on Grinding Wheel Safety" is the title of a new 24 page booklet issued by the **Norton Co.,** Worcester, Mass. This is the question and answer type safety booklet covering important facts for the operator. The points discussed are emphasized by clever illustrations. The book is closed with a speed table giving data on the peripheral speeds in ft. per min. of various grinding wheels at various r.p.m. as well as a table on recommended operating speeds for various types of grinding wheels.

» «

Transmission Handbook

The **Ideal Commutator Dresser Co.,** Sycamore, Ill., have released a new 52 page catalog covering variable speed transmissions.

This book, which is a combined catalog and handbook, covers recommendations, application data, photos and engineering information regarding Ideal Variable Speed Pulleys and automatic tension control motor basis. It gives sizes, rated capacities, design and operating details, where applicable, how installed, etc.

» «

Tramrail Bulletin

"Engineering and Application Data" is the title of a new 12 page bulletin recently issued by the Cleveland Tramrail Div., **Cleveland Crane & Engineering Co.,** Wickliffe, Ohio. This bulletin aside from giving engineering data regarding the Cleveland Tramrail, describes and pictures the various types of switches, crane and transfer bridges, buckets and grabs, as well as picturing various applications of Cleveland Tramrails in industry. Information is given on the design of Tramrail systems, study of trusses, rail designs and similar engineering information. Data is also given regarding the cost of equipment.

» «

Electrode Catalog

The Welding Equipment & Supply Co., Detroit, Mich., have recently issued a new catalog describing Eureka Tool Steel Welding Wires which are used in building up and repairing of tools and dies by the electric arc, atomic hydrogen and oxy-acetylene welding processes.

In this 16 page booklet there is described the various types of Eureka Welding Wires and recommendations as to their general application. Included

Welding Rods . . . not too plentiful, BUT . . .

if you need stainless electrodes for defense work, alloy and hard surfacing rods or other electrodes for special, out-of-the-ordinary applications, we can probably help you. Call the nearest Ryerson plant.

Electrodes in stock include:

McKay Stainless—7 types

Ryerson Shielded Arc — for Mild Steel and Alloys

Blue Coated — For Cast Iron

Phosphor Bronze—For Brass and Copper

Hard Surfacing Rods

Acetylene Welding Rods

●

Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Cleveland. Detroit, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

are many illustrations showing how this material has been effectively used in the making and rebuilding of drawing and forming dies as well as shearing blades and other tools used in the sheet metal industry. The booklet is closed with a table giving recommendations and characteristics as well as available rod size data on the eight types of electrodes manufactured by this organization.

» «

Lighting Folder

A folder entitled **"Plant Protection Begins with Floodlighting"** has just been released by the Goodrich Electric Co. Dealing with the present and urgent need for protective lighting around industrial plants, this folder illustrates the various styles of porcelain enameled floodlights available to meet the demands for illumination in different locations. All equipment listed are in accordance with FBI specifications.

In addition to many popular styles of permanent and portable floodlights, the folder also introduces a new fixture known as the Elipso Standlite, designed for high intensity and sharply defined lighting around property lines without illuminating buildings and grounds.

Copies of the folder may be obtained by writing the **Goodrich Electric Co.**, 4600 Belle Plaine Ave., Chicago, Ill. Ask for Folder No. 101.

Furnace Lining Bulletin

In a recently released 4 page pamphlet, the **A. P. Green Fire Brick Co.**, Mexico, Mo., point out the advantages of the use of Greencote Refractory Maintenance Coating. In this bulletin it is also pointed out how spalled or burned sections of furnaces may be made as serviceable as the rest of the lining by the application of Greencote. It is pointed out that in these times when furnaces are in constant use, it is possible to make emergency repairs that will permit continuous operation and avoid those delays that would be encountered if it were found necessary to reline your furnace.

» «

Furnace Brazing

How to cut production cost of metal parts with electric furnace brazing is the subject of a new eight-page booklet announced by the Westinghouse Electric and Manufacturing Co.

Percentage savings over drawing, casting, machining, drop forging and seam welding are given for typical metal parts using these processes. Electric furnace brazing, why it is used, and how it works are explained. Requirements for brazing covering materials, brazing metals, preparation, atmosphere, and furnace equipment are described.

Tabulations include all the dimensional and operating data for roller hearth, conveyor belt, and batch type copper-brazing furnaces. The booklet is well illustrated showing many metal parts that can be brazed economically in an electric furnace and installation views of typical furnace units in industrial plants.

A copy of booklet **B-3019** may be secured from department 7-N-20, **Westinghouse Electric and Manufacturing Co.**, East Pittsburgh, Pa.

» «

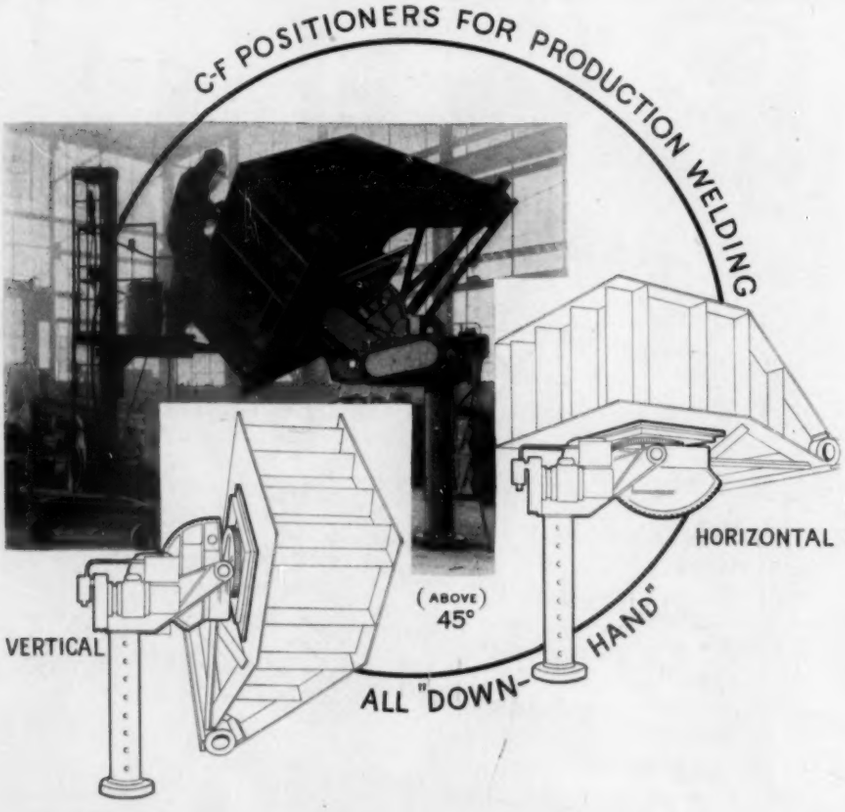
Air Remover Bulletin

The **Mine Safety Appliances Co.**, Pittsburgh, has recently released **Bulletin DP-3** which covers the M.S.A.-Lamb Air Mover. This 2 page bulletin describes this portable emergency ventilating device which can be used advantageously in welding to vent storage tanks, shipholds, manholes and other confined places which require the clearing of smoke or fumes to provide safe, comfortable working conditions. Both 3 in. and 6 in. models which employ only compressed air are described. There is also presented engineering information which gives the performance data on this venturi type air remover.

» «

Safety Bulletin

M.S.A. **Bulletin No. CS-8** recently published by the **Mine Safety Appliances Co.**, Pittsburgh, describes various protective devices for the use of sand blasters. Included is an excellent description of the M.S.A. abrasive mask and accessories which is designed to provide safe, comfortable, durable pro-



● Where there are many parts to fabricate into one unit and many welds to make in doing it, C-F Positioners with push button operation for tilting and turning save welder's time, save crane time, and save production time. Positioned welds are better welds because they may all be made "down-hand".

●

Write for Bulletin WP 20 which describes these production machines for fast economical welding.

●

CULLEN-FRIESTEDT CO.,
1309 S. KILBOURN AVE. CHICAGO, ILLINOIS

tection for shot and sand blast operators and has been approved by the U. S. Bureau of Mines. In addition, various sand blast operators' accessory products are described including gloves, sleeves, leggings and air blowers.

» «

Respirator Bulletin

In a new 2 page **Bulletin No. CS-6** the **Mine Safety Appliances Co.**, Pittsburgh, describe the M.S.A. Airline Respirator. This respirator is designed for use by those desiring complete protection against welding and cutting fumes, paint spray vapors and pigments, fumes from toxic or burning metals and toxic dusts. In addition to describing and picturing the respirator, information is also given on the various types of fillers, gauges and blowers that are used in connection with this equipment.

» «

Structural Codes

The American Institute of Steel Construction announces a revision and a new edition of two of its important and widely used documents:

1. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings. Revised July, 1941.
2. Code of Standard Practice for Steel Structures other than Bridges. Revised August, 1941.

Rather extensive revisions have been included in the new issue of the Specifications embracing such matters as Materials, Loads and Stresses, Unit Stresses, Design, Fabrication, Erection and Inspection. The Code has been revised only in that part relating to weights of standard fillet welds. The Code also contains the standard contract forms used by the members of the industry.

Copies of either document may be had for ten cents (10c) each by addressing the **American Institute of Steel Construction**, 101 Park Avenue, New York, N. Y.

» «

Employment

Subcontracting for Defense: A Study Prepared in the Interest of Stabilizing Employment, is a report just issued by the Policyholders Service Bureau of the Metropolitan Life Insurance Co. This study outlines the methods followed by 28 companies that have been outstandingly successful in meeting the problems of prime contracting or subcontracting. It includes a section on obtaining prime contracts for various types of supplies and equipment required by the Government; describes sources of information on governmental requirements and on procurement setup and procedure. It discusses the administration of and responsibility for subcontracting in the prime contractor's organization, and steps commonly followed in selecting and scheduling work to be farmed out. The report also shows a variety of sources which primary contractors use to locate and contact subcontractors, and methods adopted for appraising their facilities and skill.

The procedure followed in obtaining a subcontract is thoroughly covered in the report by a presentation of details of the methods used by successful subcontractors. Some of the other points covered are: the assistance typically given by the prime contractor to the subcontractor, production control procedures for both the prime contractor and the subcontractor, and the basis for pricing subcontract work. The study includes a number of practical charts and diagrams illustrating methods and procedures successfully used by contributors to the survey.

A copy of this report is available to executives who request it on their business stationery. **Policyholders Service Bureau,** Metropolitan Life Insurance Co., One Madison Ave., New York.

Machinery Bulletin

Bulletin **QW-106,** issued by the Quickwork Whiting Div., **Whiting Corp.,** Harvey, Ill., describes the Quickwork Metal Working Machine. In this 4 page bulletin there is pictured the rotary shears and attachment, throatless shears, power hammers and stamping trimmers manufactured by this company. Typical applications pointing out some of the advantages of this equipment are shown in some of the illustrations.

» «

Trimmer Bulletin

In a 4 page bulletin, **QW-107,** the Quickwork Whiting Div., **Whiting Corp.,** Harvey, Ill., describes the new Quickwork Whiting Stamping Trimmer. There is given the specifications and a number of illustrations showing how this equipment can be used advantageously to trim, form, bead and

New
G-R
Model
55-S
For UNIONMELT* at its BEST
• With a Model 55-S supplying a smooth, stable arc current under perfect control, you get all the advantages of speed and economy from UNIONMELT and automatic-head welding. Simple, compact and highly efficient, Model 55-S delivers the most welding for every kilowatt of power, every foot of floor space, every hour of time on the job. Installation is fast and inexpensive; relay-operated primary contactor and remote-controlled output current regulator units are built in, completely wired and ready for use. Current range of the Model 55-S is 400 to 800 (rated) with a maximum of over 1000 amperes, operating from 220 or 440-volt, 60-cycle single phase a.c. power supply. Check over the features below . . . here's a unit that can save precious time and step up output on your job! (Don't forget — the G-R line includes manual, multi-operator manual and automatic sets from 125 to 2,000 amperes.)
1. AUXILIARY TRANSFORMER (2 kw) supplies 110 v. power for relays; outlets provided to plug in vacuum melt recovery system, remote controls, etc.
2. FAN (high capacity type) keeps air moving past coils and core, prevents high heat build-up.
3. RELAYS are reliable, job-tested assemblies for dependable service. Simple unit construction; all wiring complete, ready for use.
4. PERFECT CONTROL is provided right from welding head or other convenient point with remote-controlled G-R current regulator; leads plug in on panel.
5. METERS give constant check on output (ammeter and voltmeter supplied).
6. POWER FACTOR correctors (optional) are G-R designed and built, fit inside rugged case for compactness and protection.
7. RUGGED CONSTRUCTION — all-welded steel frame and case, spun glass and mica insulation, accurate die-stamped core and rigidly-fixed coils mean long, trouble-free life under toughest service.
1
2
3
4
5
6
*Trademark registered by Linde Air Products.
WRITE, PHONE OR WIRE FOR DATA...
GLENN-ROBERTS COMPANY
5651 W. OHIO STREET, CHICAGO, ILL. • P. O. BOX 1814 WASHINGTON, D. C.
1009 FRUITVALE AVENUE, OAKLAND, CALIFORNIA

flange large or small stampings in straight line production or job shop work.

» «

Steel Standards

The **American Institute of Steel Construction** has just issued a pamphlet entitled **"Adoptions of the A.I.S.C. Standard Specification"** which notes that 268 cities and 14 governmental bodies have adopted or permit the use of the specification incorporating an allowable basic working stress for structural steel for buildings of 18,000 pounds per square inch. In addition, 429 cities and 20 public bodies, to effect a more economical and efficient use of structural steel, have adopted or permit the use of the 20,000 pounds per square inch basic stress specification in their codes.

» «

Tool Catalog

"Tools for the Defense of America" is the title of a new catalog showing the complete line of electric tools for defense industries which is manufactured by **Skilsaw, Inc.**, 5033 Elston Ave., Chicago. In this 48 page book there is illustrated, described and priced, the various portable electric saws, drills, belt sanders, hand sanders, and disc sanders, which are made by Skilsaw, Inc., as well as bench grinders, blower and suction cleaners, floor sanders, floor edgers and the general accessories and attachments that are used with these tools. The catalog is known as **Catalog No. 43.**

» «

Welding Training

A new book prepared primarily to assist instructors in planning courses for the training of oxy-acetylene welding and cutting operators has just been published by the International Acetylene Association. The book, **"Training Oxy-Acetylene Welding and Cutting Operators — Instructors Outlines"** is divided into three chapters. The first outlines the essential information that should be presented in a course for the training of a general welding operator, an aircraft-welding operator, and a pipe-welding operator. The second chapter contains in outline form the material that is essential to the training of various types of cutting operators. The third chapter outlines the essential information that should be given in a course for inspectors and a specification of the primary requirements of students who take the inspector's course. Furthermore, these outlines furnish the basis for many other types of specialized courses, and suggestions for completing these are included in the book.

The material presented throughout the book has been divided into self-contained units, each of which includes the four essential parts of any particular lesson, namely, an outline for a classroom lecture, suggestions for study assignments, recommendations for the material that should be demonstrated and discussed, and a description of the practice exercises the student should do in the shop. Recommendations for qualitative testing of the work done are included throughout the book. An introduction describes in considerable detail the organization of the book and gives suggestions for its use.

Copies of this new 88-page book can be obtained by writing to the Secretary of the **International Acetylene Association,** 30 East 42nd St., New York. Paper-bound copies are 25 cents each. A de luxe edition, cloth-bound, has also been prepared and can be obtained for 75 cents a copy.

» «

Safety Catalog

A new 111-page safety equipment catalog has just been published by **American Optical Co.,** Southbridge, Mass. Complete protection from head to ankles is provided by the safety items described which include industrial goggles, Calobar lenses, Super Armorplate lenses, welding lenses, welding plates, welding helmets and hand shields, safety clothing, respirators, first-aid kits, etc.

Two of the interesting features of the catalog are: (1) An eye protection guide which outlines in chart form industrial classifications, types of eye-hazardous jobs, and the equipment designed to provide proper protection on these jobs; (2) a table which gives suggestions, based on hundreds of proved applications, for the choice of the proper shade of glare-protection glass for a number of industrial jobs involving exposure to glare.

» «

Brazing Booklet

How to cut production cost of metal parts with electric furnace brazing is the subject of a new eight-page booklet announced by the **Westinghouse Electric and Manufacturing Co.** Data is given on the percentage savings over drawing, casting, machining, drop forging and seam welding for typical metal parts using these processes. Electric furnace brazing, why it is used, and how it works are explained. Requirements for brazing covering materials, brazing metals, preparation, atmosphere, and furnace equipment are described. Tabulations include all the dimensional and operating data for roller hearth, conveyor belt, and batch type copper-brazing furnaces.

The booklet is well illustrated showing many metal parts that can be brazed economically in an electric furnace and installation views of typical furnace units in industrial plants. A copy of booklet **B-3019** may be secured from department 7-N-20, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

COLMONOY FURNACE WELDING for HIGH PRODUCTION PARTS—

Such as Centerless Grinder Rests

This method consists of applying a casting of COLMONOY NO. 6 alloy to a steel base, by a furnace bonding process requiring no additional bonding material. One of the advantages of this process is its adaptability to high production parts, or intricate parts inaccessible for torch application.

COLMONOY NO. 6 is effecting substantial savings on machine tool parts subject to great wear and abrasion—lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, screw machine fingers, forming and drawing edges, etc.

COLMONOY may be cast or applied as an overlay, using gas or electric welding equipment.

DEFENSE ORDERS demand that machines stay on the job. KEEP YOUR MACHINERY ON THE JOB by hard facing the wearing parts with COLMONOY.

Write for Catalog

Full information on the various grades of COLMONOY that meet every hard surfacing requirement.

WALL-COLMONOY CORP.

Sixth Floor, Buhl Bldg., Detroit, Mich.

558 W. 54th St. NEW YORK — 625 W. Jackson Blvd. CHICAGO — 208 Midco Bldg. TULSA

21 Seneca St. BLASDELL, N. Y. — 123 W. Philadelphia St. WHITTIER, CALIF.

(Trade Mark Registered)

Doubly-Deoxidized Welding Alloys:

PENN BRONZE

TITAN BRONZE

TITAN MANGANESE BRONZE

Titan's Quality Control

ASSURES ABSOLUTE UNIFORMITY OF TITAN WELDING ALLOYS

Quality Control in manufacture of TITAN Welding Alloys begins with the selection of the finest available raw materials.

Only the purest raw materials are used: Electrolytic copper 99.96 plus in purity, and electrolytic zinc 99.99 plus. This assures the elimination of elements which if introduced would prove detrimental to quality and uniformity.

Maintenance of unvarying uniformity of mixtures and of casting temperatures, under strict laboratory control, further assures absolute uniformity of TITAN Alloys.

Descriptive literature sent upon request

TITAN METAL MANUFACTURING CO., BELLEFONTE, PA.

TITAN WELDING RODS

FLUXINE

TRADE MARK REGISTERED U.S. PATENT OFFICE

FLUXES MEET YOUR EVERY FLUXING REQUIREMENT FOR JOINING EVERY TYPE OF METAL AND ALLOY.

FLUXINE No. 18

has no equal for gas welding all NICKEL CHROME ALLOYS, NICKEL, MONEL METAL, INCONEL and STAINLESS IRON.

No. 18 induces quick flow of rod and deep penetration. Leaves no porosity. Flux scale is easily removed. Meets U. S. specifications. Use in gas welding Stainless Steel and Inconel manifolds, etc. Sample and prices on request.

Write for our "FLUXINE CHART"; it tells you the proper flux and rod to use on any metal joining job.

MADE ONLY BY

KREMBS & COMPANY

MANUFACTURERS OF CHEMICALS SINCE 1875

CHICAGO, ILL., U.S.A.

HERE'S AN ADVANTAGE WORTH CONSIDERATION

The T-slots in the table top of Ransome Positioners facilitate setting-up pieces to be welded. Four radial and four longitudinal slots mean only one quick set-up before starting to weld.

Ransome Welding Positioners

- Save labor time
- Reduce crane service
- Increase production
- Produce better welds

Industrial Division

RANSOME CONCRETE MACHINERY COMPANY

DUNELLEN NEW JERSEY

1942 Calendar

The **Brown Instrument Co.**, Wayne & Roberts Ave., Philadelphia, has published a very clever calendar for 1942. The new calendar portrays the varied problems encountered in modern industrial processes by a series of original cartoons by Bill Eddy. The drawings have been reproduced in four colors to keep them as similar to the original as possible.

» «

Vise Folder

In a new 6 page folder, the **Studebaker Machine Co.** describes the Studebaker **Hydraulic Visepress.** In this illustrated folder there is pictured many ways in which this hydraulic vise may be used in various industrial applications. Close-ups are shown of the hydraulic foot controls and other pertinent features of this vise.

» «

Equipment Catalog

The **Mall Tool Co.**, 7740 S. Chicago Ave., Chicago, have released a new 56 page catalog describing the industrial equipment of that organization. In its profusely illustrated pages there is found information regarding uses, descriptions and other pertinent facts on flexible shaft machines and attachments for grinding, sanding, buffing, polishing, filing and drilling. There is also described portable electric drills and portable electric saws, as well as engineering data on remote control flexible shafts and housings.

» «

Tool Catalog

In a new 8 page bulletin known as **Catalog 45,** the **Wodack Electric Tool Corp.,** Chicago, describe their complete line of electric tools for construction, installation, production and maintenance work. Pictures, specifications and complete technical detail is given regarding their various electric drills, grinders, sanders, hammers, and accessory equipment for Wodack electric tools.

Recent Patents

Arc Movement

2,265,954. **Herbert O. Quartz,** West Allis, Wis., assigned to **Allis-Chalmers Co.,** Milwaukee, Wis. Filed July 27, 1940. Issued Dec. 9, 1941. This patent relates to a method of producing a series of time interval spaced electric arc welding operations which comprises establishing a stable metal depositing and fusing arc between the electrode and a portion of the work which is to be welded, maintaining the electrode in its stable metal depositing and fusing arc relation with respect to that portion of the work until that portion has been welded to the desired extent, withdrawing the electrode from the work a suffi-

cient distance to establish and maintain a stable non-metal depositing and nonfusing arc between the electrode and the work, then moving the electrode toward that portion of the work which is to be next welded a sufficient distance to establish a stable metal depositing and fusing arc between the electrode and that portion, and maintaining the electrode in its stable metal depositing and fusing arc relation with respect to that portion until it has been welded to the desired extent.

» «

Electrode

2,266,422. **Franz R. Hensel** and **Earl I. Larsen,** Indianapolis, Ind., assigned to **P. R. Mallory & Co., Inc.,** Indianapolis, Ind. Filed July 10, 1940. Issued Dec. 16, 1941. This patent covers a pressure exerting resistance welding electrode having a working tip formed of a compact body of copper powder sinter-bonded into a hard integral unit.

» «

Carbon Holder

2,266,239. **Clayton P. Nielsen.** Chicago, Ill. Filed Aug. 28, 1939. Issued Dec. 16, 1941. An object of this invention is to provide a device for holding carbons properly adjusted to control the heat of the arc. The holder is manipulated from the side so that the work and the arc are always clearly visible to the operator. The holder is made out of two metals, such as brass and steel, one of the metals being nonferrous and capable of conducting electricity without heating to any appreciable degree, and the other metal being ferrous and a good conductor of electricity, but which probably will heat to a greater degree than the nonferrous conductor. The ferrous metal having a lower heat conductivity is capable of resisting heat from the arc and preventing a feed-back to the handle.

» «

Multiple Point Welding

2,266,424. **Stanley M. Humphrey,** Warren, Ohio, assigned to **Taylor-Winfield Corp.,** Warren, Ohio. Filed May 28, 1940. Issued Dec. 16, 1941. The electrode of this invention is particularly applicable where it is desired to simultaneously effect multiple point welds with the use of a conventional spot welder having but one movable electrode operating assembly. The unit effects welds at a multiplicity of spaced points irrespective of variations in the thickness of the stock at the various points. This is accomplished by providing one of the electrodes with a plurality of relatively movable fingers which are free to independently move through a suitable distance and providing resilient means to exert forces on the fingers to insure maintenance of the required welding pressure. The resilient means is a block of soft rubber which urges the fingers into engagement with the stock at the points to be welded.

» «

Portable Welder

2,266,730. **James L. Anderson,** Closter, and **John H. Begerow,** Carlstadt, N.J., assigned to **Air Reduction Co., Inc.,** New York. Filed Feb. 17, 1939. Issued Dec. 23, 1941. In welding torch carriages which move along a desired course on work to be welded it has been customary to provide the carriage with an electric motor having a centrifugal governor attached to the motor housing and driven directly from the armature shaft of the motor, and forming with the motor a single structural unit. According to the invention the motor and governor are so connected that either of them can be removed for repair or replacement without removing the other. In addition, the governor can be run at less than motor speed, thereby decreasing the wear on the governor.

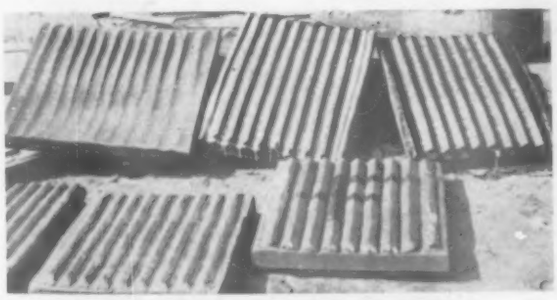
» «

Manganese Alloy Welding

2,266,762. **Theophil E. Jerabek,** East Cleveland, Ohio, assigned to **The Lincoln Electric Co.,** Cleveland. Filed Mar. 9, 1939. Issued Dec. 23, 1941. In the deposition in molten form of alloy compositions which contain substantial amounts of manganese, many difficulties may arise. It is customary to em-

REGISTERED MANGANAL U. S. PAT. OFFICE

(U. S. PATENTS 1,876,738, 1,947,167 AND 2,021,945)



Crusher Plate Rebuilt with Applicator Bars

11 TO 13½% MANGANESE NICKEL STEEL

APPLICATOR BARS

Round, Square, Flat, Special Shape for reclaiming worn Jaw Crushers, Mantles, R.R. Crossings, Dredge Bucket Lips, Tumblers, Pump Shells, Impellors, Dippers, etc.

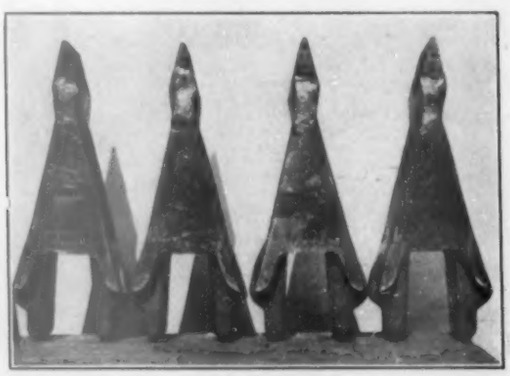
Save Steel for National Defense

WELD WITH MANGANAL

CAST WEDGE BARS

for repointing worn-down Shovel and Dipper Teeth

Send for descriptive circulars and name of nearest distributor



Dipper Teeth Repointed with Cast Wedge Bars

STULZ-SICKLES CO. *Sole Producers* 91 N. J. Railroad Ave., Newark, N. J.

ploy substantial amounts of nickel or cobalt or both in order that upon normal cooling the deposit will remain predominantly austenitic. The inventor has found that deposits may be materially improved and the cost of welding substantially decreased by the employment of another alloying element in partial or entire substitution for either the nickel or cobalt or both. The substitute element is copper. A typical electrode comprises: Carbon, 0.50% to 1.20%; Manganese, 7.00% to 15.00%; Nickel or Cobalt, about 10.00%; Copper, 0.10% to 10.00%; and Tungsten or Molybdenum, not over 2.00% or Vanadium, not over 1.00%. The tungsten, molybdenum and vanadium are hardening elements. The remainder of the composition of the electrode is iron.

» «

Blowpipe

2,267,104. **Wilgot J. Jacobsson,** Plainfield, and **Samuel R. Oldham,** Newark, N. J., assigned to **Oxweld Acetylene Co.,** of West Virginia. Filed Nov. 4, 1939. Issued Dec. 23, 1941. One object of this invention is a blowpipe having high efficiency and flashback resistant characteristics, which may be used with fuel gas at either medium or low pressure. The blowpipe does not require the removal and substitution of parts, or careful adjustment, when changing from fuel gas at one pressure to that at another. The blowpipe uses a separate valve means associated with the fuel gas delivery passage, and independent of the combustion-supporting gas supply conduit, for so restricting the flow of fuel gas that fuel gas supplied at medium pressure is reduced within the delivery passage, before delivery adjacent to the injected combustion supporting gas stream, to the proper low pressure for aspiration by the combustion-supporting gas.

» «

Weldor's Foot Protector

2,267,253. **Charles H. Ream,** Brooklyn, N.Y. Filed Mar. 25, 1941. Issued Dec. 23, 1941. A footwear and legwear protector which includes a guard shaped to fit on a shoe or similar footwear, and a resilient, U-shaped ankle clamp assembled with the upper portion of the guard. The clamp constitutes a retainer for the guard. The guard is long enough to place the clamp above the article of footwear so that the clamp can also be used to retain the trousers leg in a folded condition.

» «

Spot-Welding Pliers

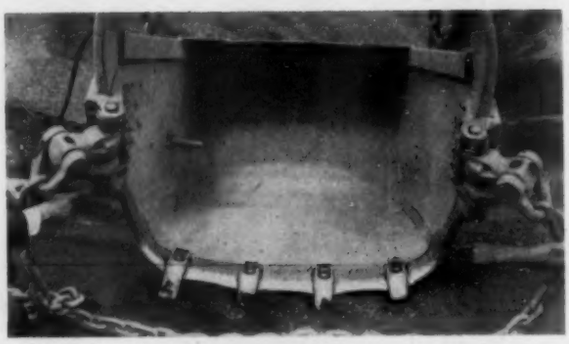
2,267,927. **Arthur A. Campbell, Jr.,** Madison, Wis. Filed Feb. 1, 1940. Issued Dec. 23, 1941. The patent describes a portable electric spot-welding pliers which has a head, a jaw and a handle rigidly fixed to and insulated from the head. A movable jaw is pivotally connected to the head and has an arcuate toothed inner end. A movable handle is carried by the head by means of a yielding pivotal connection in slots in the head. The movable handle has an arcuate toothed outer end to mesh with the teeth on the inner end of the movable jaw. The jaws carry electrodes, which, when brought into contact with the material to be welded, close a circuit.

» «

Welding Apparatus

2,265,287. **Charles S. Johnson,** Champaign, Ill., assigned to **Oxweld Acetylene Co.,** of West Virginia. Filed Jan. 25, 1940. Issued Dec. 9, 1941. A welding apparatus is shown which includes a blowpipe holder and a jointed beam for supporting the holder for movement in any direction in horizontal planes and for maintaining the holder in predetermined angular relation to those planes. The jointed beam comprises an arm turnable at one end about a vertical axis, and a pair of parallel links extending from the free end of the arm to the blowpipe holder, the ends of the parallel links being pivoted about parallel horizontal axes to the arm and to the blowpipe holder, respectively, the links thereby being free to shift about the axes in a vertical plane. There is also provided an inelastic diagonal tension member extending between the arm and the parallel links to limit the downward shifting motion of the links.

COATING WITH COAST



COAST METAL No. 110
Stretches One Month Into Eight

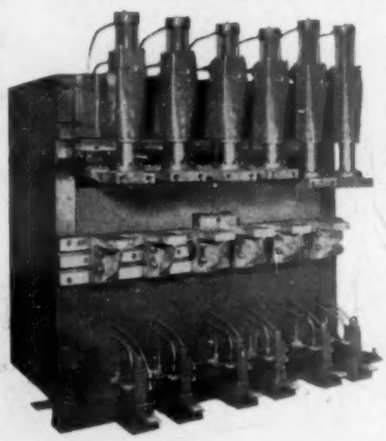
For eight months this dragline bucket, surfaced with Coast Metal No. 110 on all wearing parts, has been in steady operation without repair in a hot open hearth slag dump.
Other buckets working under the same conditions whose wearing parts are not protected with Coast Metal require general overhauling every thirty days, including new wear strips, lip, knuckles, etc. With Coast Metal, the bucket will be resurfaced on parts subjected to the greatest wear and returned to service at a fraction of the original surfacing cost. Needless to say, the owner is highly satisfied and endorses Coast Metal for similar work. One of the 11 types of Coast Metal Hard Facing Rods will do the job better on your particular hard surfacing requirements too.

Write today for descriptive literature and the name of your local jobber

COAST METALS, Inc.
1006 McKinley Ave. S. W.
CANTON, OHIO

SPEED-UP
For Defense and Victory With ACRO Welders

Shell Cases are Welded Continuously, Accurately and Fast on this specially designed Acro Projection Welder.



When it comes to making shell cases on a real production basis this hydraulically operated Acro Projection Welder fills the bill. It has six independent work stations, each controlled by an individual operating valve and actuated by a hydraulically-operated system through double acting cylinders. Capacity of the transformer is 350 K.v.a. Controls consist of ignitron tube contactor, pneumatic welding period timer, eight point heat regulator and other accessories to provide a complete machine.

Step up your production—consult Acro for the machine to fit your particular needs. Acro is prepared to design any type spot, seam or butt welder. The standard line of Acro Welders gives trouble-free service on all types of resistance welding. Write today for more details. There will be no obligation.

ACRO WELDER MFG. CO., Inc.
1827 West St. Paul Ave., Milwaukee, Wis.

Banish Welding Fumes!

Here's a Practical Welding Fume Collector that Removes Noxious Gases, Heat and Smoke at the Source

*Pat. Re-21,277

- Effectively removes smoke, gas and heat created by arc welding. Especially useful where alloy steels are used. Many hundreds in daily operation.
- Special bench type models are available for defense training schools. Write for descriptive bulletin No. 37-C.

RUEMELIN MFG. CO.

3880 N. Palmer St. Milwaukee, Wis.

RUEMELIN FUME COLLECTOR

WELDING rod producers appreciate the uniform bonding obtained with PQ Silicates of Soda. And the user of rods is pleased too, because he can get good fluxing action which speeds up welding.

Many a manufacturer stopped his search for the right silicate bond for his private formulae when he consulted the PQ Catalog. It includes over 30 different grades in liquid, solid and powder forms to aid the welding industry.

Philadelphia Quartz Co.

General Offices and Laboratory: 125 South 3rd Street, Philadelphia.
Chicago Sales Office: 205 West Wacker Drive. Stocks in over 60 cities.

SILICATE OF SODA SPECIALISTS

For SAFETY SPEED ECONOMY

MANIFOLDS

REGULATORS

VALVES and FITTINGS

to control high pressure gases

The BASTIAN-BLESSING Co.

278 E. ONTARIO ST. CHICAGO

Pioneers and Manufacturers of Precision Equipment for Using and Controlling High Pressure Gases